THE
RAILWAY GAZETTE

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AEI

DIESEL ELECTRIC LOCOMOTIVES

The A E I "Explorer" Locomotive in service in East Africa.

This is an 1100 hp Diesel-electric locomotive, built with the co-operation of Lister Blackstone, specially designed to give outstanding service where the going is hard. It is particularly suitable for overseas railways operating in difficult terrain.

All enquiries should be addressed to the local AEI office or direct to AEI Traction Division, Trafford Park, Manchester 17.

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Traction Division
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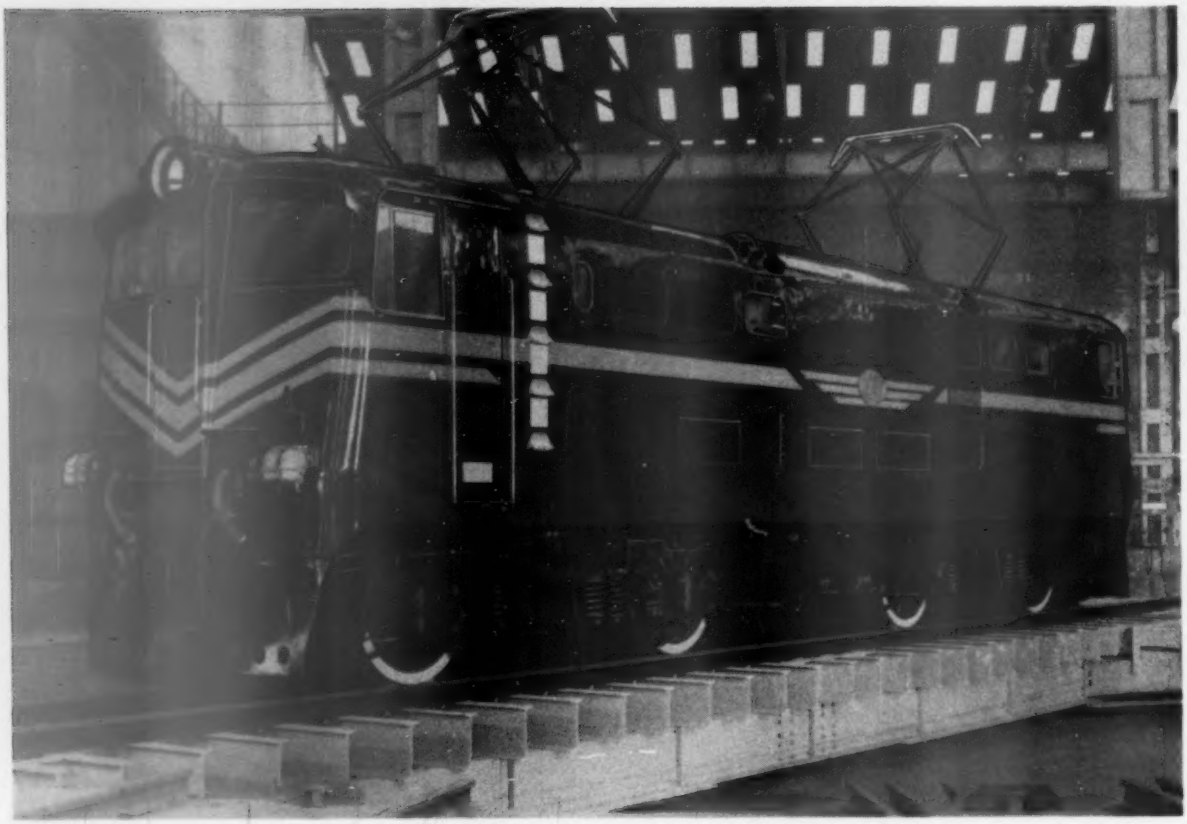
K/T907



35 Type 3.E.I. Electric Locomotives are being built by METRO-CAMMELL for the South African Railways.
(MAIN CONTRACTORS – AEI LTD.)

METRO-CAMMELL

ELECTRIC LOCOMOTIVES FOR South African RAILWAYS

METROPOLITAN-CAMMELL CARRIAGE & WAGON CO. LTD.

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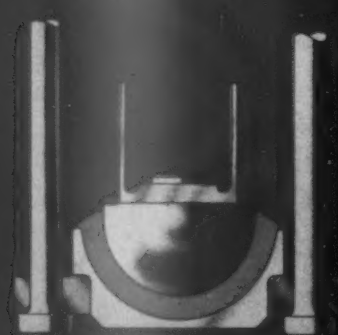

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Metalastik components eliminate direct metal-to-metal contact and thereby cut out wear, noise and the need for lubrication. With a wide range of units to choose from, it is possible to provide for movement in any desired direction, yet with ample constraint in others.

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Among valuable components are:

(1) The Spherilastik Bearing, permitting three-dimensional movement, for use as pivots. One of the many applications of these bearings—each end of a traction link fitted to a Werkspoor bogie—is shown below.

(2) The Metalastik Ultra-Duty Bush, accepted in every branch of engineering as the ideal component for meeting oscillating movement and misalignment without lubrication.

(3) The Divided Roller Pivot, permitting a hinge-like movement, together with end location, for swing hangers.

(4) A Hemi-Spherical Bonded Bearing, another form allowing universal movement with great load capacity.

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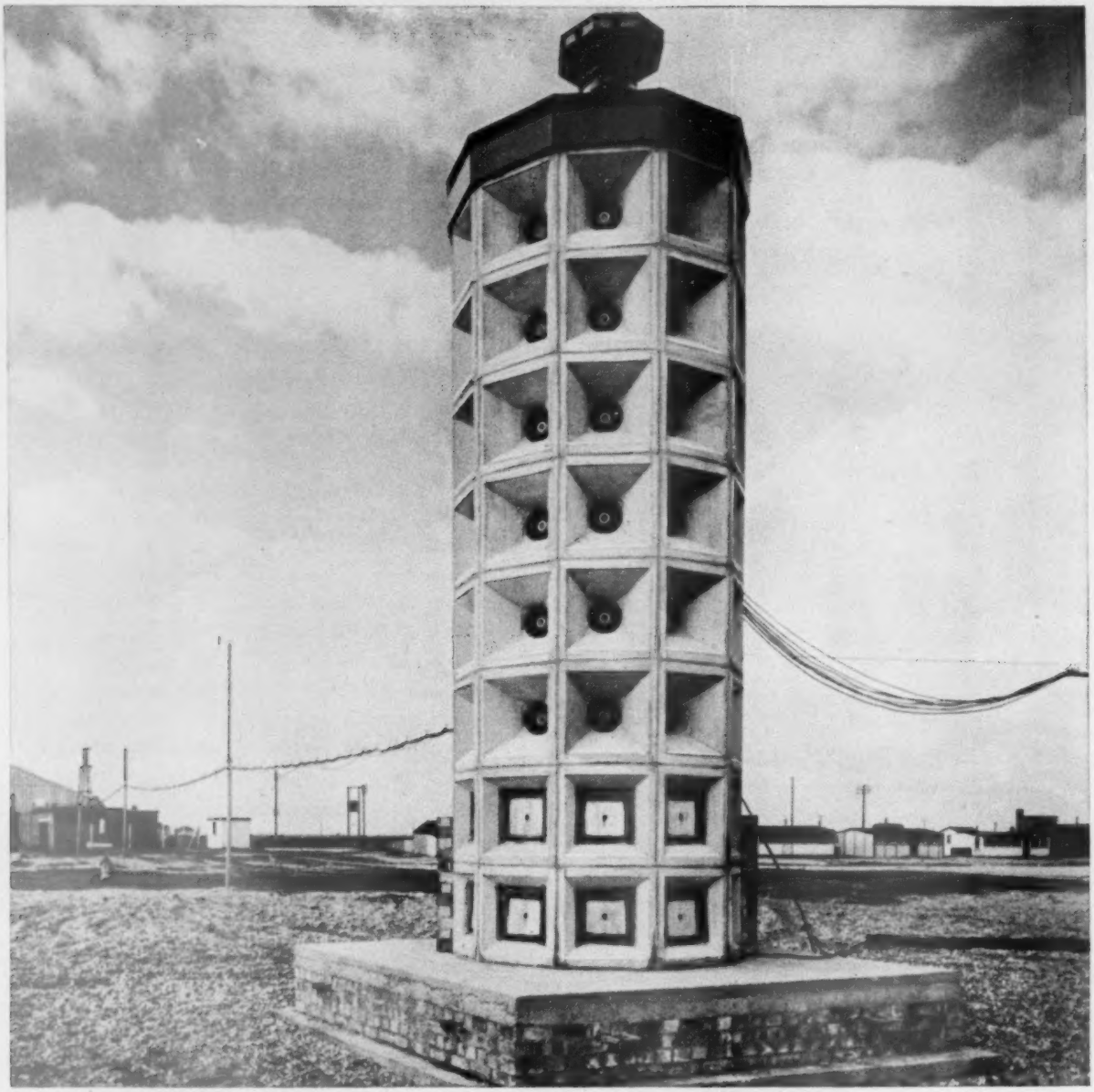

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General view of London Transport's Upminster Railway Depot, District Line, at night.

General view from the lighting tower at the west end, showing the car examination shed on the left with the lifting shop in the centre and stabling sidings on the right. In the background is the second lighting tower, with local lighting at its base. The row of short posts by the walkway in the centre of the picture carries talk-back loudspeakers.

THE SIGNALLING MATERIAL
for this depot was supplied by

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WESTINGHOUSE BRAKE AND SIGNAL CO. LTD., 82 York Way, King's Cross, London, N.1
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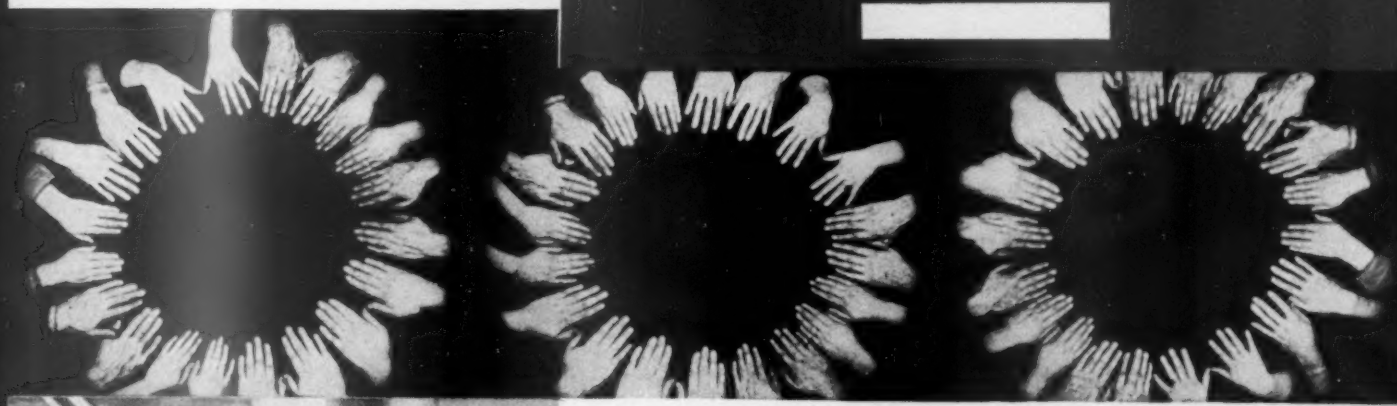

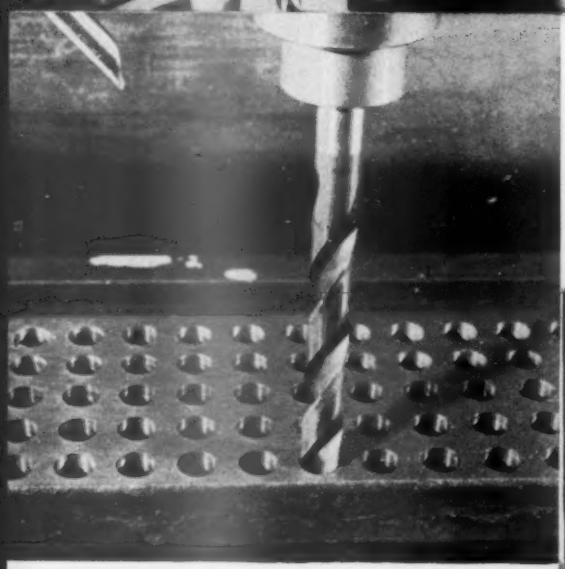

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It takes at least thirty people—thirty pairs of skilled hands—to make one DORMER Drill. Every operation is performed by experienced operators with the most up-to-date machinery. Careful heat-treatment and inspection are equally essential in maintaining the consistently high standard of DORMER Tools.

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THE FINEST BY ANY STANDARD

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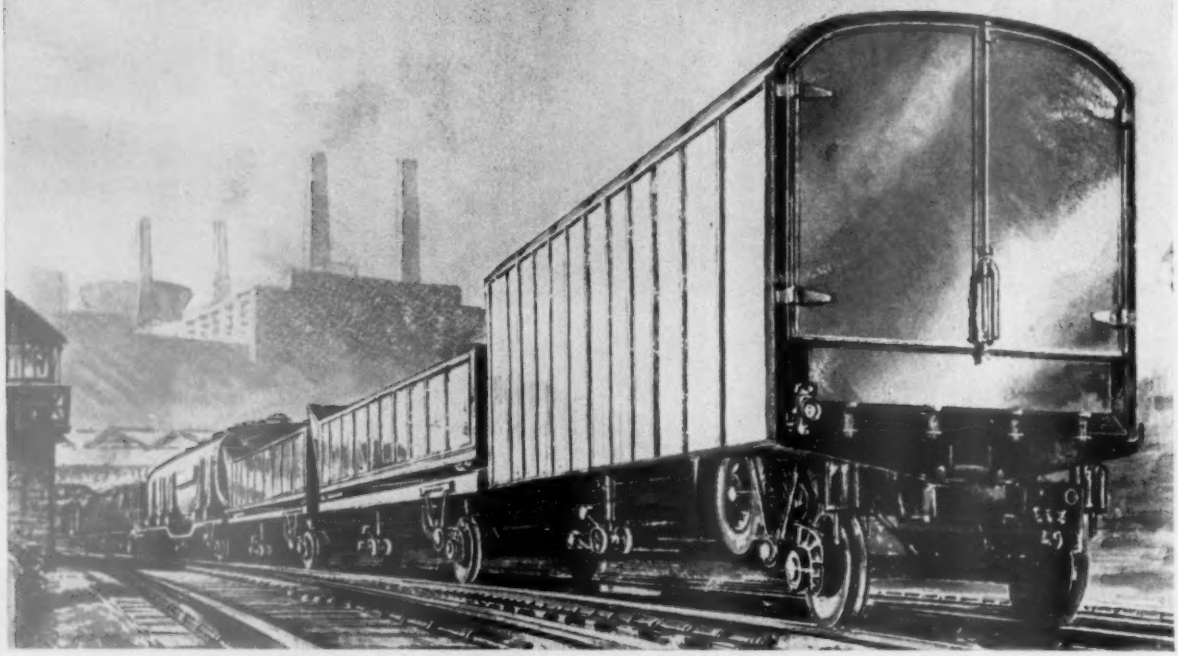
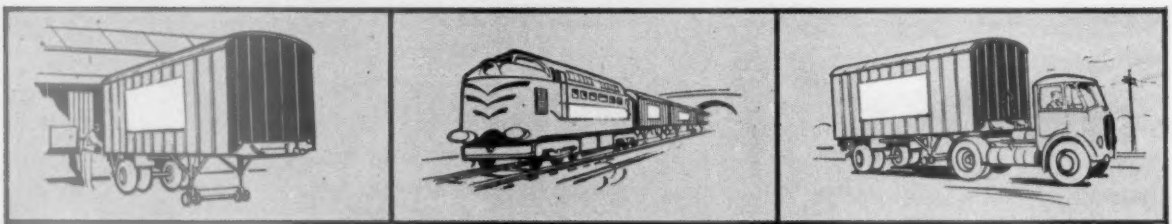


...speed and economy on trunk hauls and door-to-door service too!



1 The Roadrailer, loaded at the factory as an ordinary articulated lorry.

2 The Roadrailer as part of a fast freight train.

3 The Roadrailer converted back to a lorry completes delivery by road.

Now it's an 11-ton lorry, loaded in the usual way and driven by road to the railhead. Only 150 seconds to retract the road wheels and lower the rail wheels and hey presto – now it's part of a fast freight train designed for through travel at an average speed of 60-65 m.p.h.

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The introduction of the Roadrailer is in *any* country's interest: it frees the roads, puts trunk haulage on the railway where it sensibly and economically belongs, and helps industry by making transport cheaper and faster.

150 SECONDS — YOU CAN HAVE THE BEST OF BOTH WORLDS

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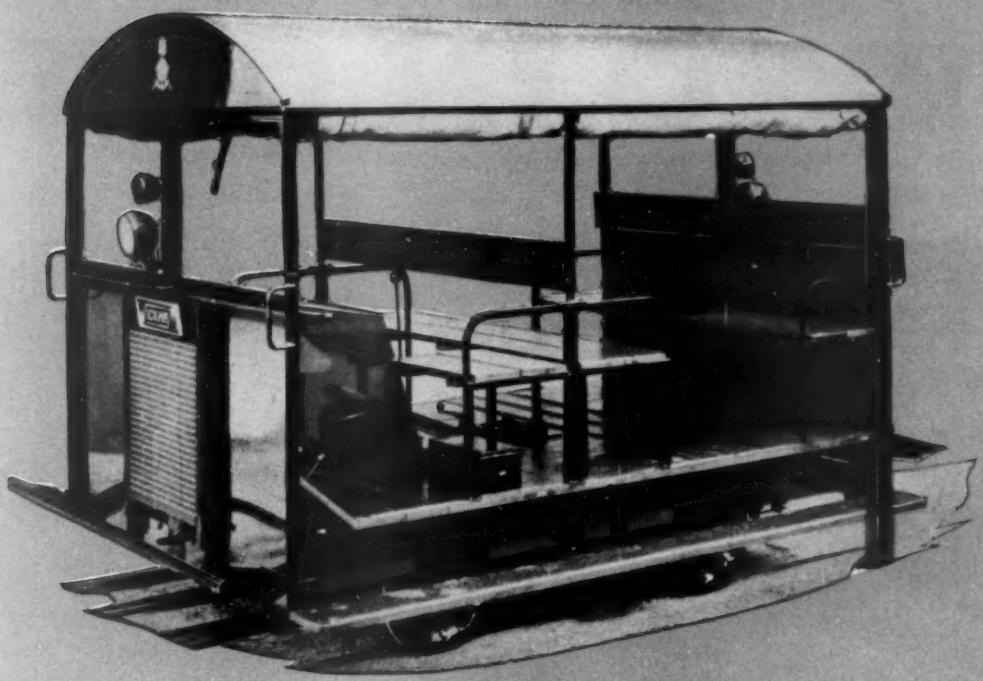

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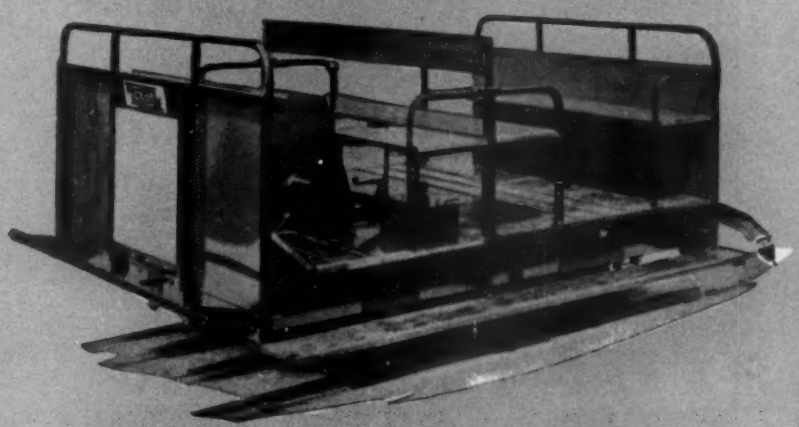

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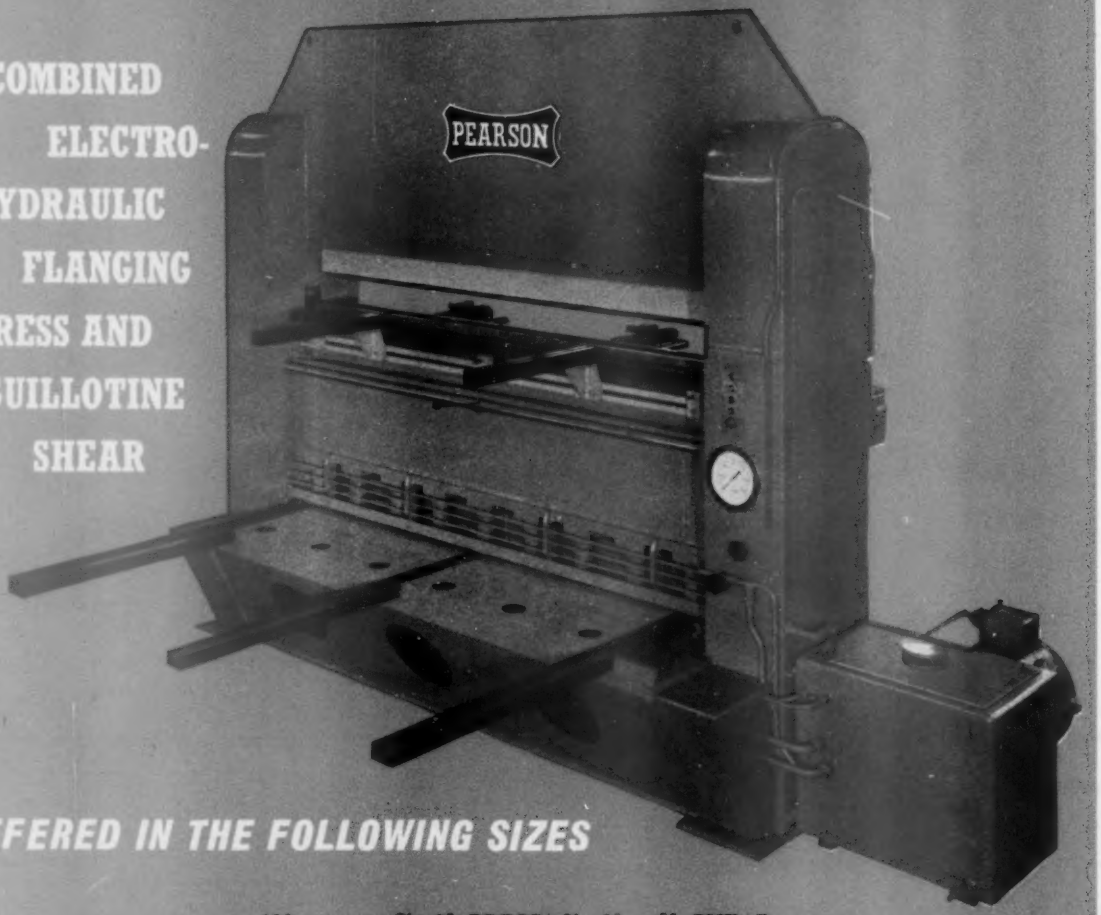

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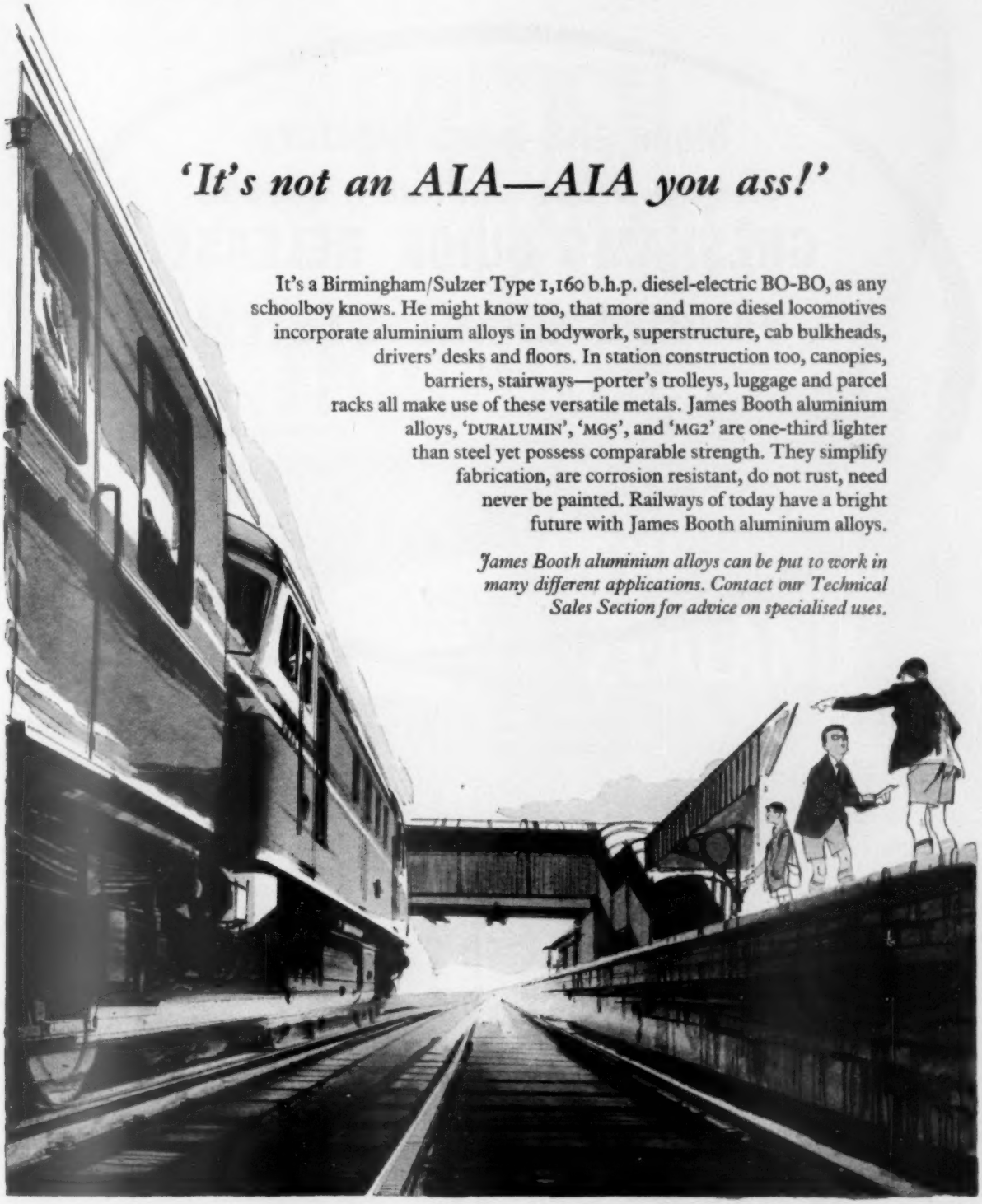
'It's not an AIA—AIA you ass!'



It's a Birmingham/Sulzer Type 1,160 b.h.p. diesel-electric BO-BO, as any schoolboy knows. He might know too, that more and more diesel locomotives incorporate aluminium alloys in bodywork, superstructure, cab bulkheads, drivers' desks and floors. In station construction too, canopies, barriers, stairways—porter's trolleys, luggage and parcel racks all make use of these versatile metals. James Booth aluminium alloys, 'DURALUMIN', 'MG5', and 'MG2' are one-third lighter than steel yet possess comparable strength. They simplify fabrication, are corrosion resistant, do not rust, need never be painted. Railways of today have a bright future with James Booth aluminium alloys.

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Fully Automatic in event of breakaway. Inexhaustible brake reserve. The safest brake in the world.

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Standard vacuum braked vehicles can be hauled by railcars with the brakes fully effective throughout.

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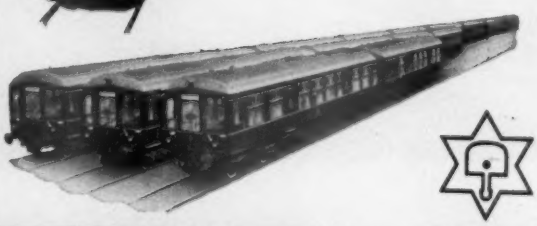

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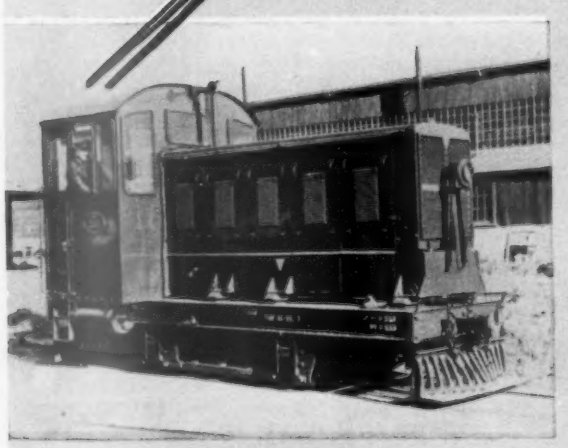
DIESEL ENGINES
POWER SHUNTING LOCOMOTIVES

operated by the Government Railways in NEW ZEALAND



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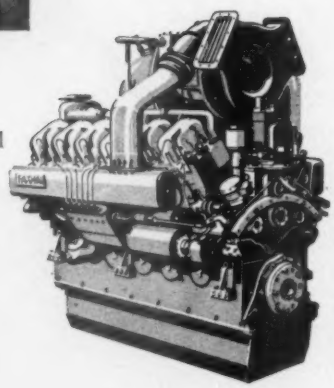
Here today is the rail-traction diesel of the immediate future . . . the Paxman VENTURA! It's the only all-British designed rail-traction diesel which combines the best ever power-to-weight ratio and extreme compactness with maximum accessibility . . . providing powers from 1000 to 2300 b.h.p. per unit. The VENTURA is the latest and greatest advance in diesel power for main-line railway systems . . . it's the product of thirty year's experience in the design, production and application of rail-traction diesels.



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FOR MAIN-LINE 'BO-BO', 'CO-CO' AND HIGH SPEED DIESEL TRAIN SETS WITH TOTAL REQUIREMENTS UP TO 4,000 H.P.

Paxman rail-traction power units range from 4 to 2300 h.p.

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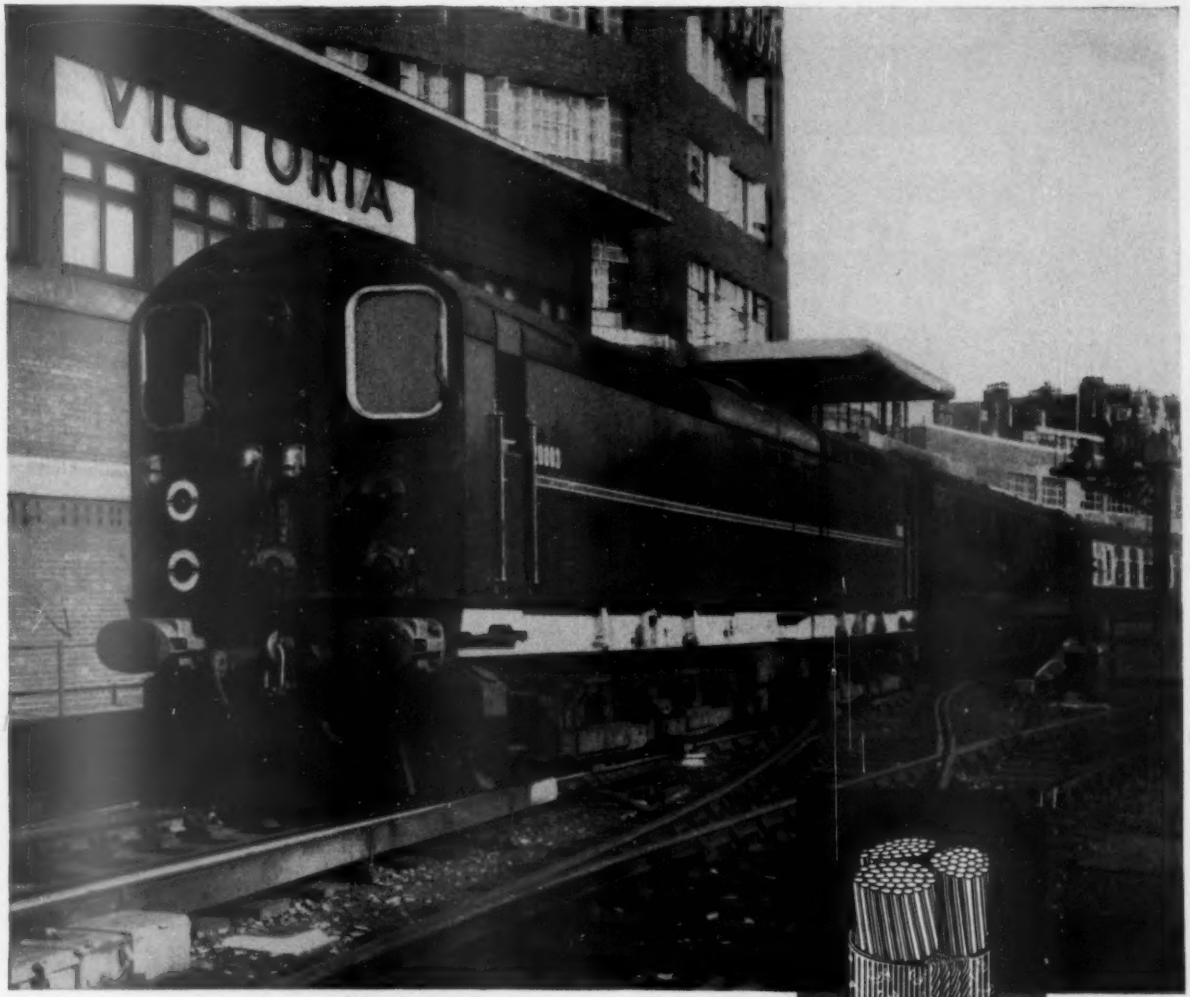

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Corrosion is a constant menace in many industries and a really serious problem where it endangers the high safety factor called for in the railway field. The service life of conventionally served cables is limited if exposed to corrosive agents but Hackbridge P.V.C. sheathed cables are especially designed to resist attack from oils, acids and alkalis. P.V.C. sheathing can be provided on all power and communication cables giving a flexible, yet mechanically strong, covering which will not support combustion.

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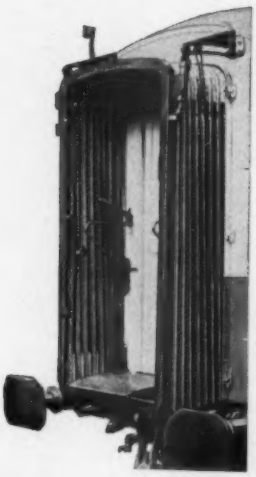

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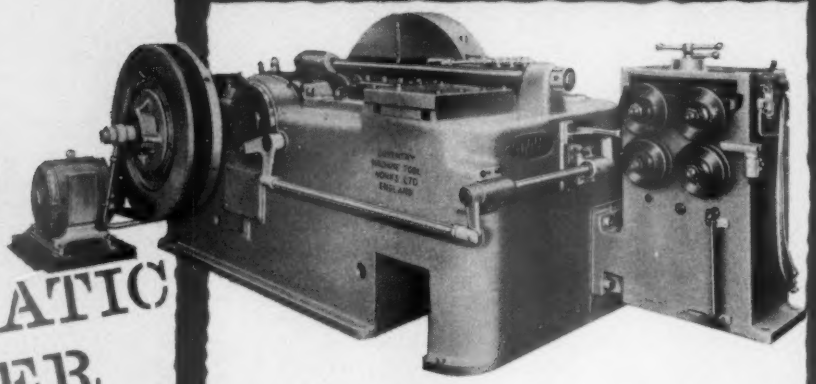
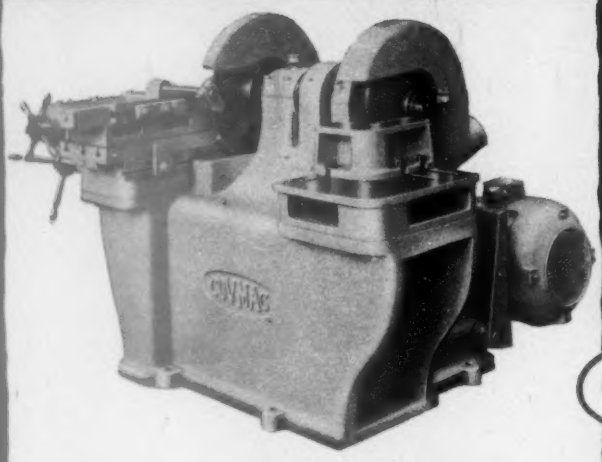


No. 2 machine with guards removed.

The stock is placed between the rolls and is then fed through the dies to the workstop. The die then closes, cutting off the stock to the required length, and delivers it to the heading position. The heading tool then completes the forging, which falls down the chute and is taken away by conveyor.

The Automatic Forger can be supplied in several sizes and for making balls of up to and including 4 in. diameter.



No. 3 machine illustrated.

These machines are made in three sizes. The smallest handles bars up to 2 in. diameter. The largest size, as illustrated, takes bars up to 4 in. diameter. They are an invaluable asset to any forging or drop stamping plant.

We also make nine sizes of Standard Upsetting Machines to take bars from ¾ in. to 6 in. diameter.

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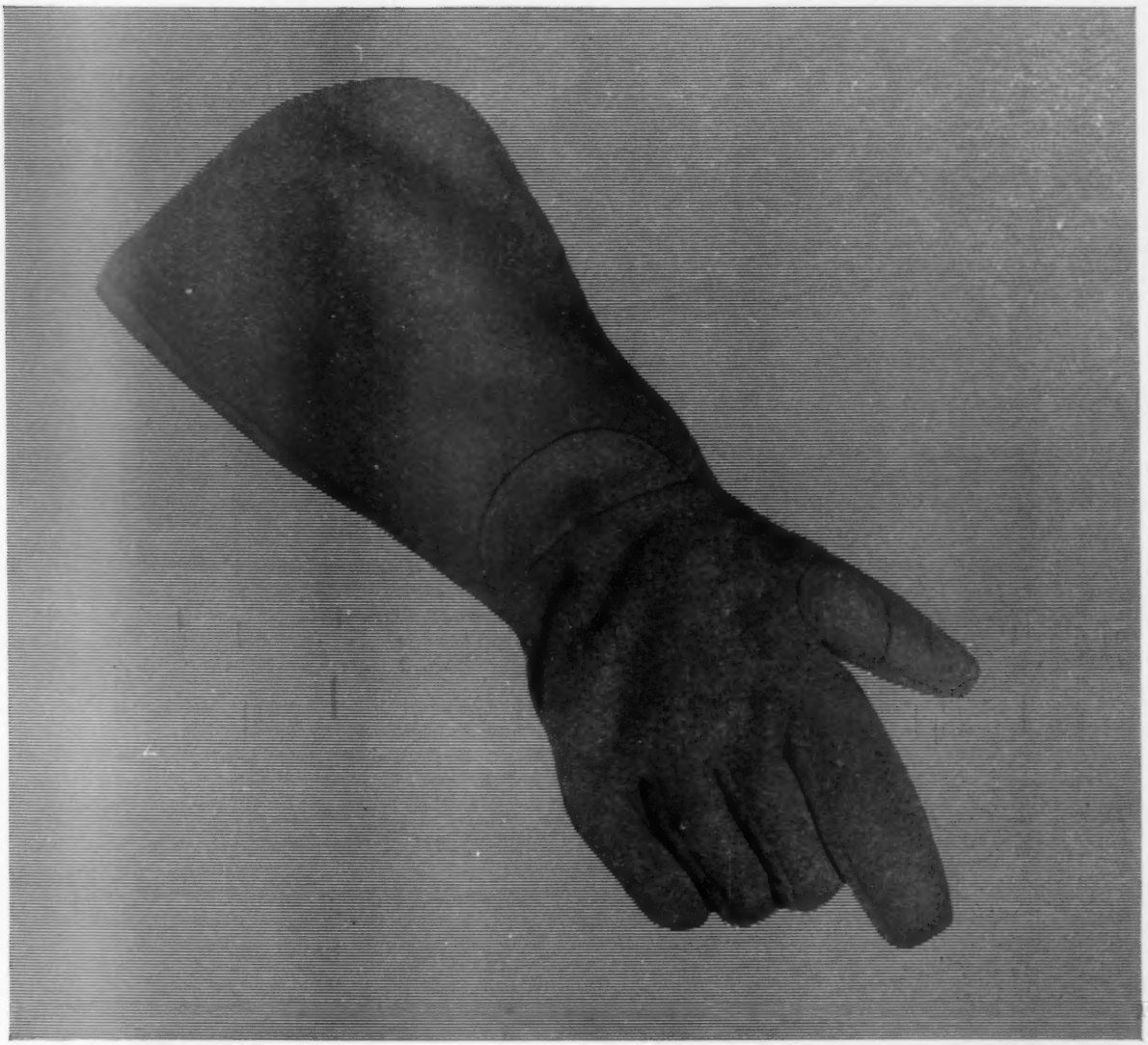

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Please write for full particulars.

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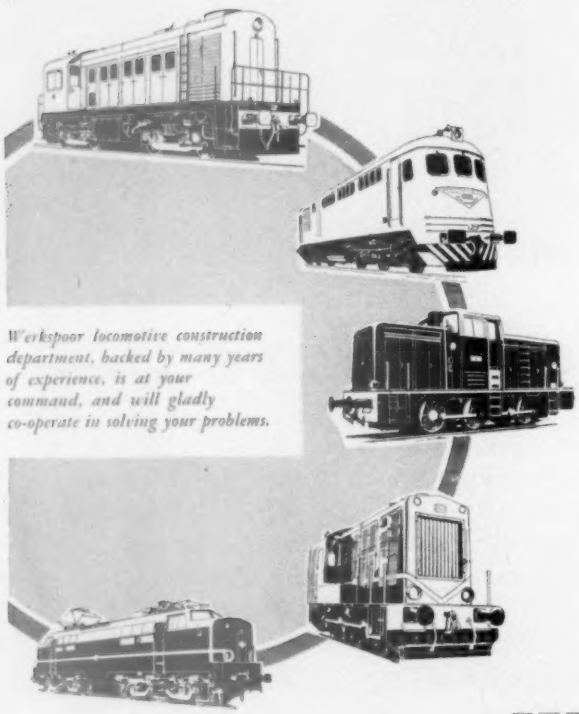
WERKSPOOR

Locomotives for any specific purpose



Werkspoor locomotive construction department, backed by many years of experience, is at your command, and will gladly co-operate in solving your problems.

Locomotives in great variety, ranging from 300 to 2300 h.p., are built by Werkspoor. Recent deliveries include Diesel-electric locomotives Diesel-hydraulic locomotives Electric locomotives. For special requirements, Werkspoor have also supplied sparkless locomotives for use in oil refinery yards, and dustproof locomotives for work on desert railways. Many Werkspoor locomotives are powered by diesel engines of Werkspoor design and manufacture.

WERKSPOOR

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Bauduin

PIONEERS IN

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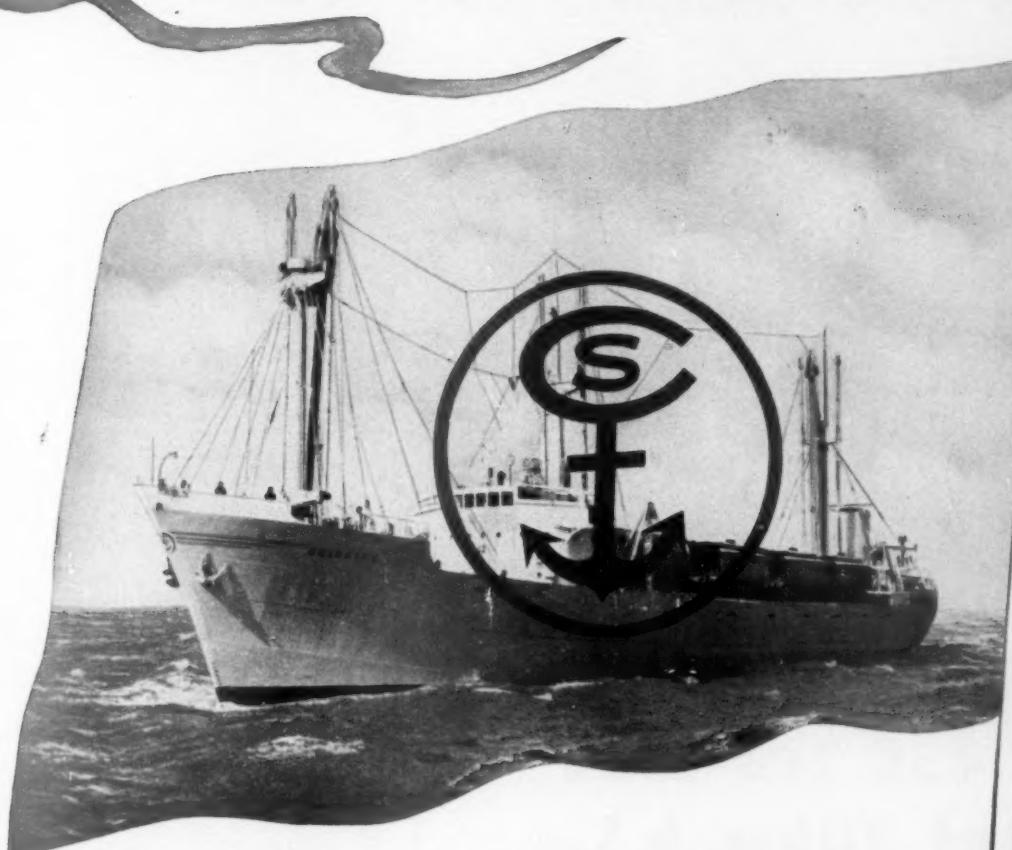

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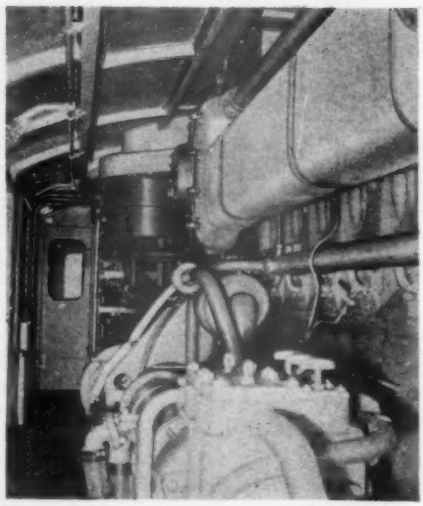

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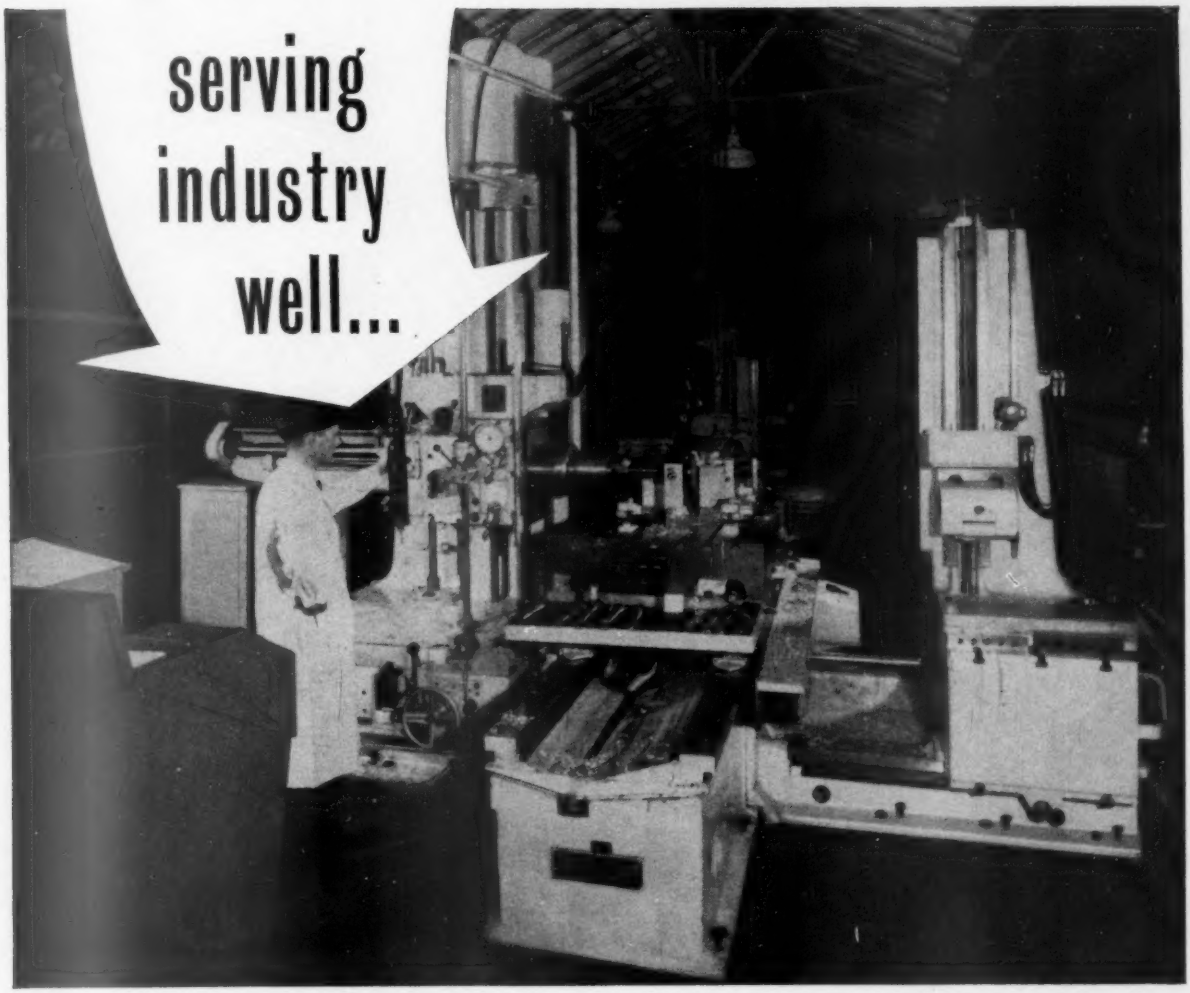

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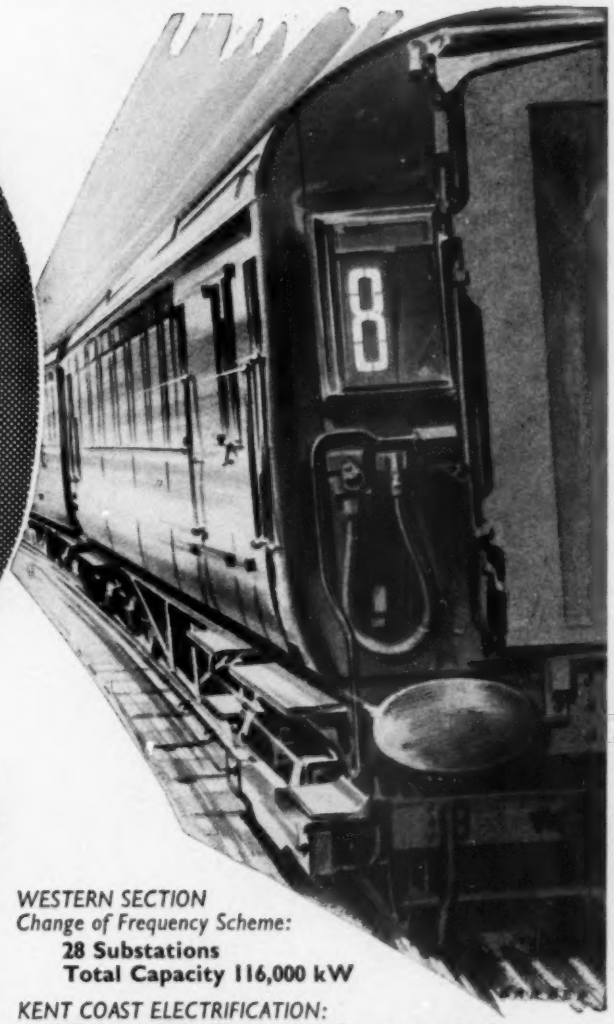

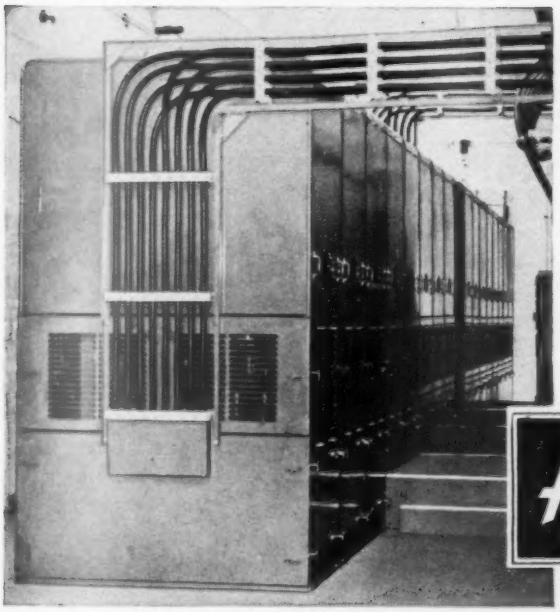

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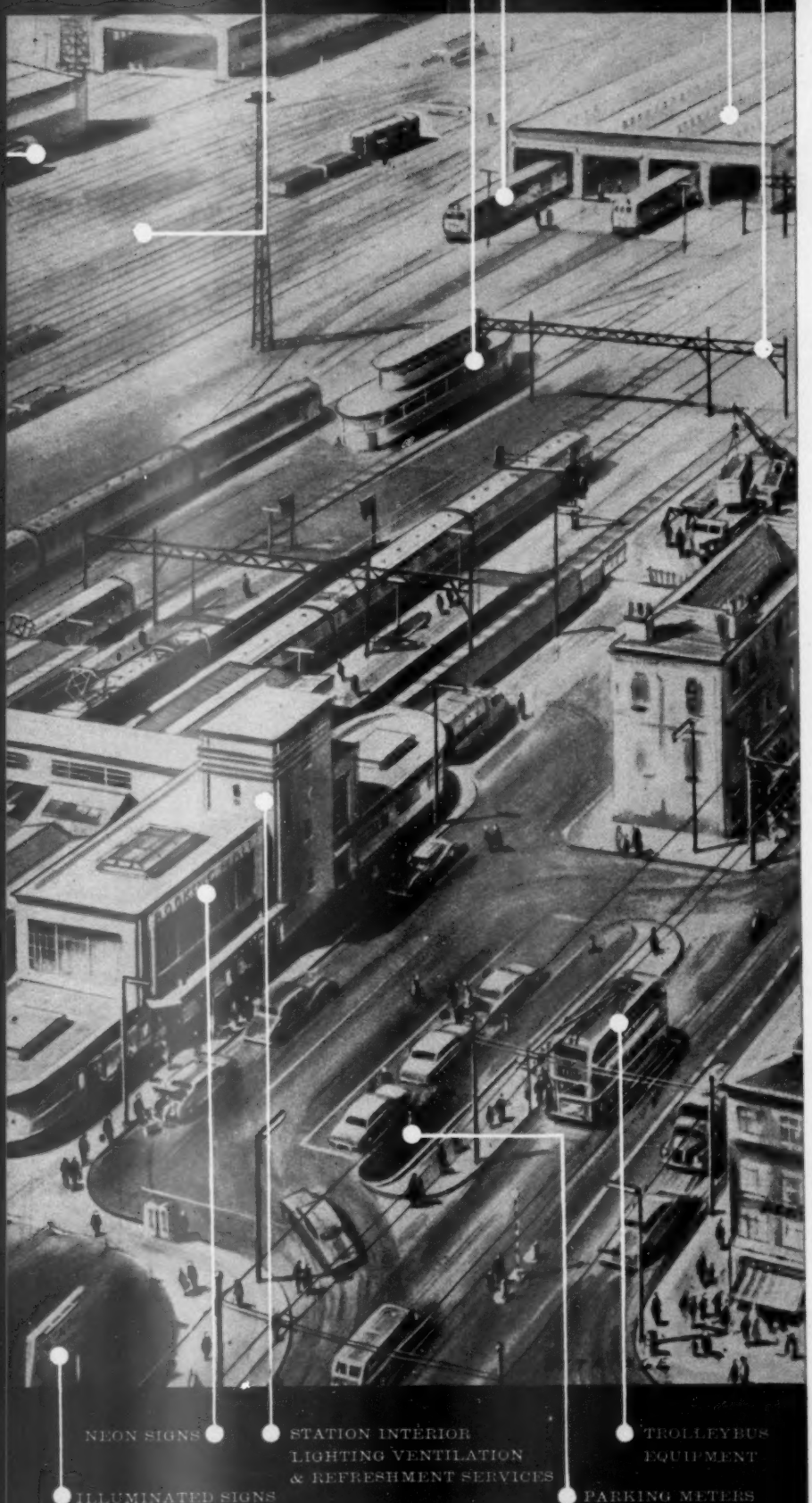

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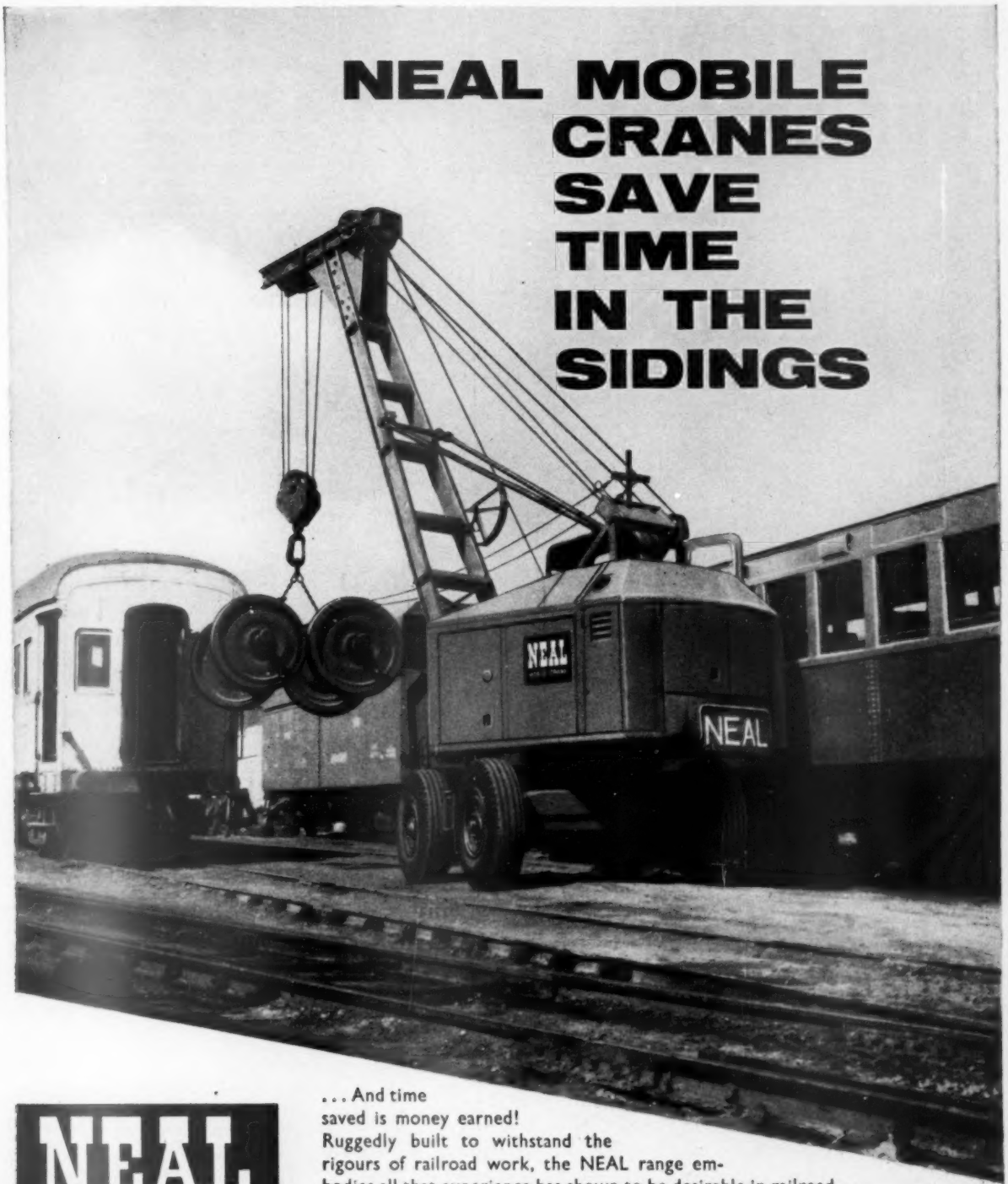

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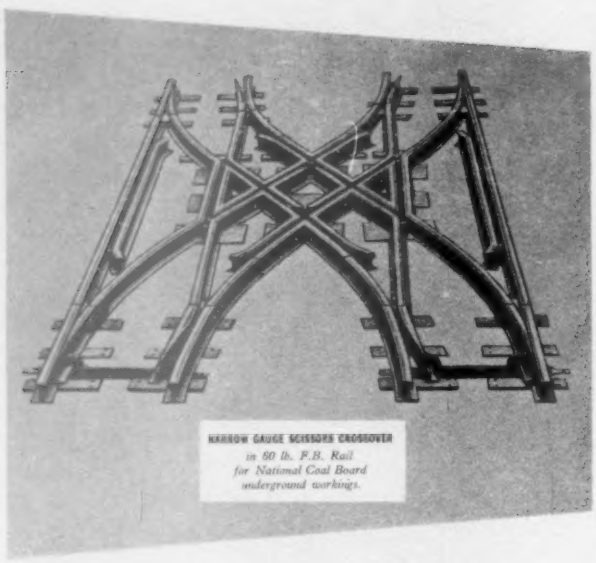

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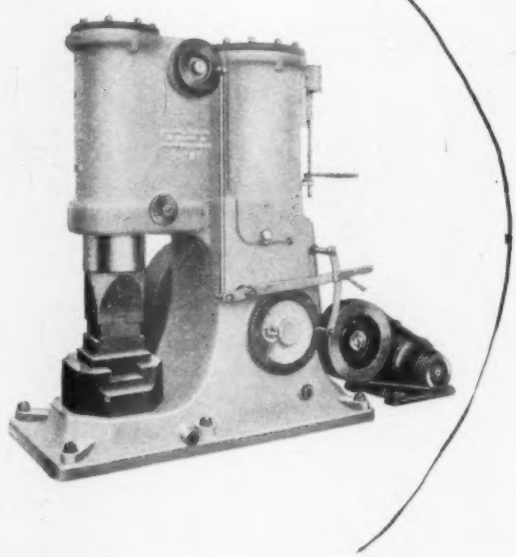

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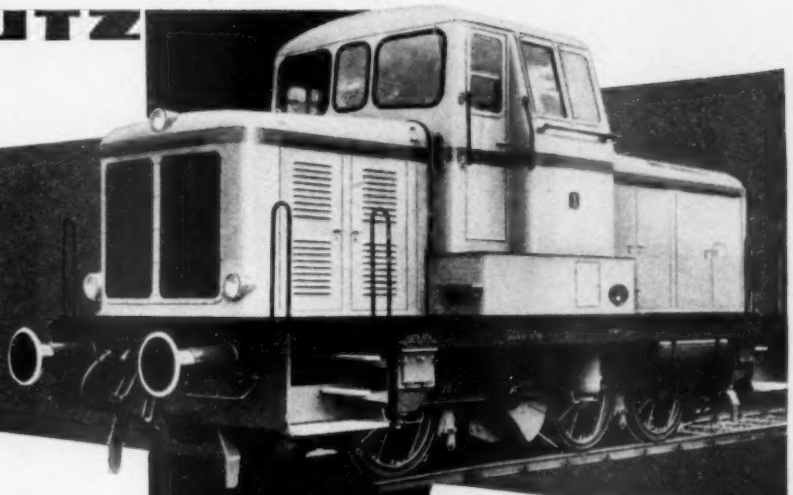

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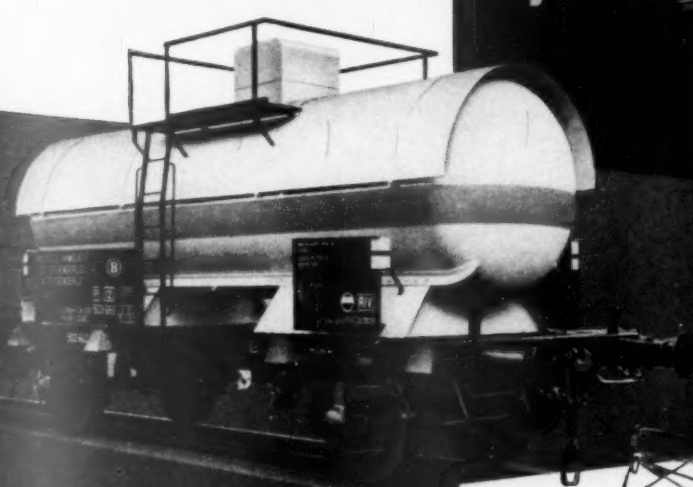

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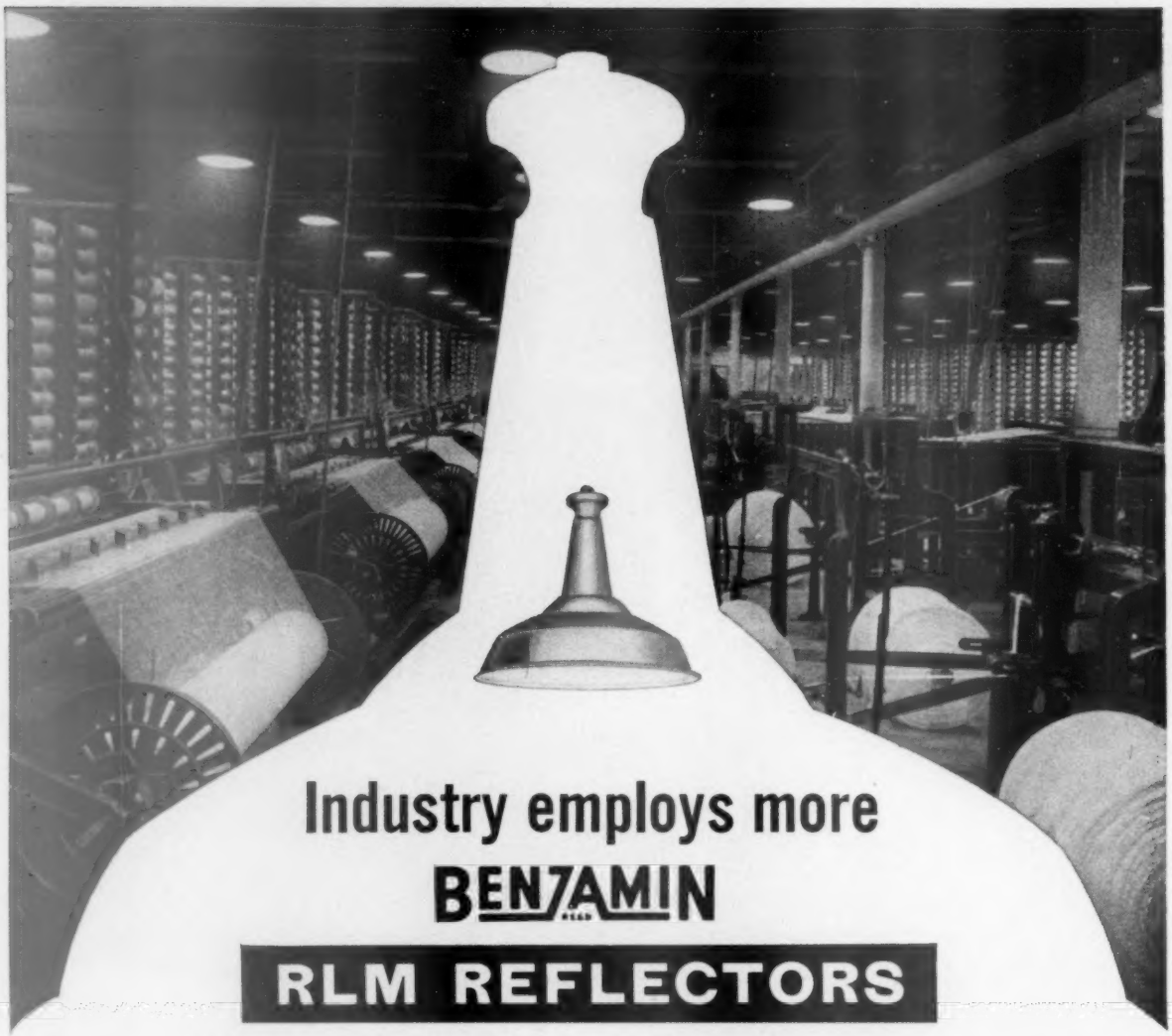

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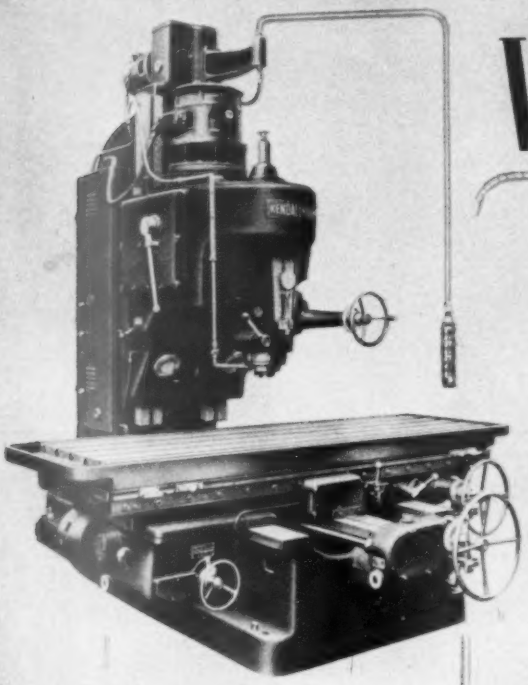

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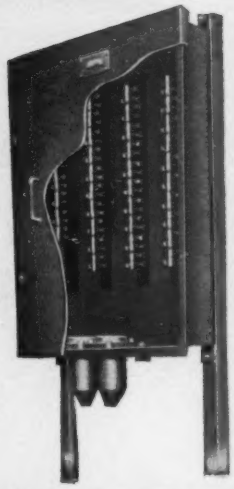

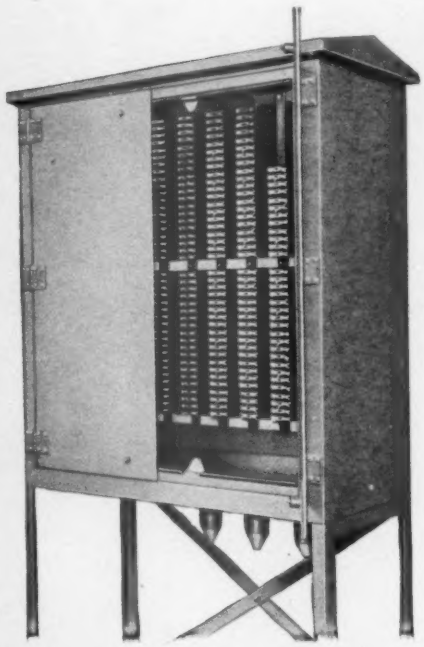

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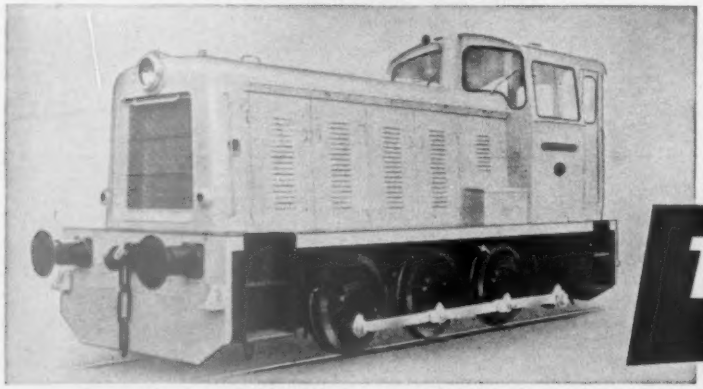

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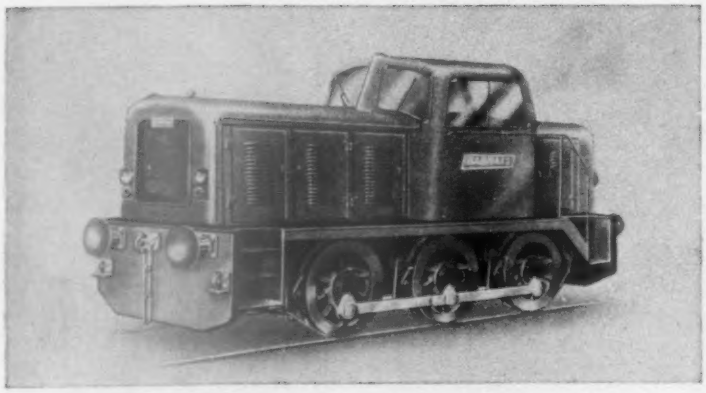

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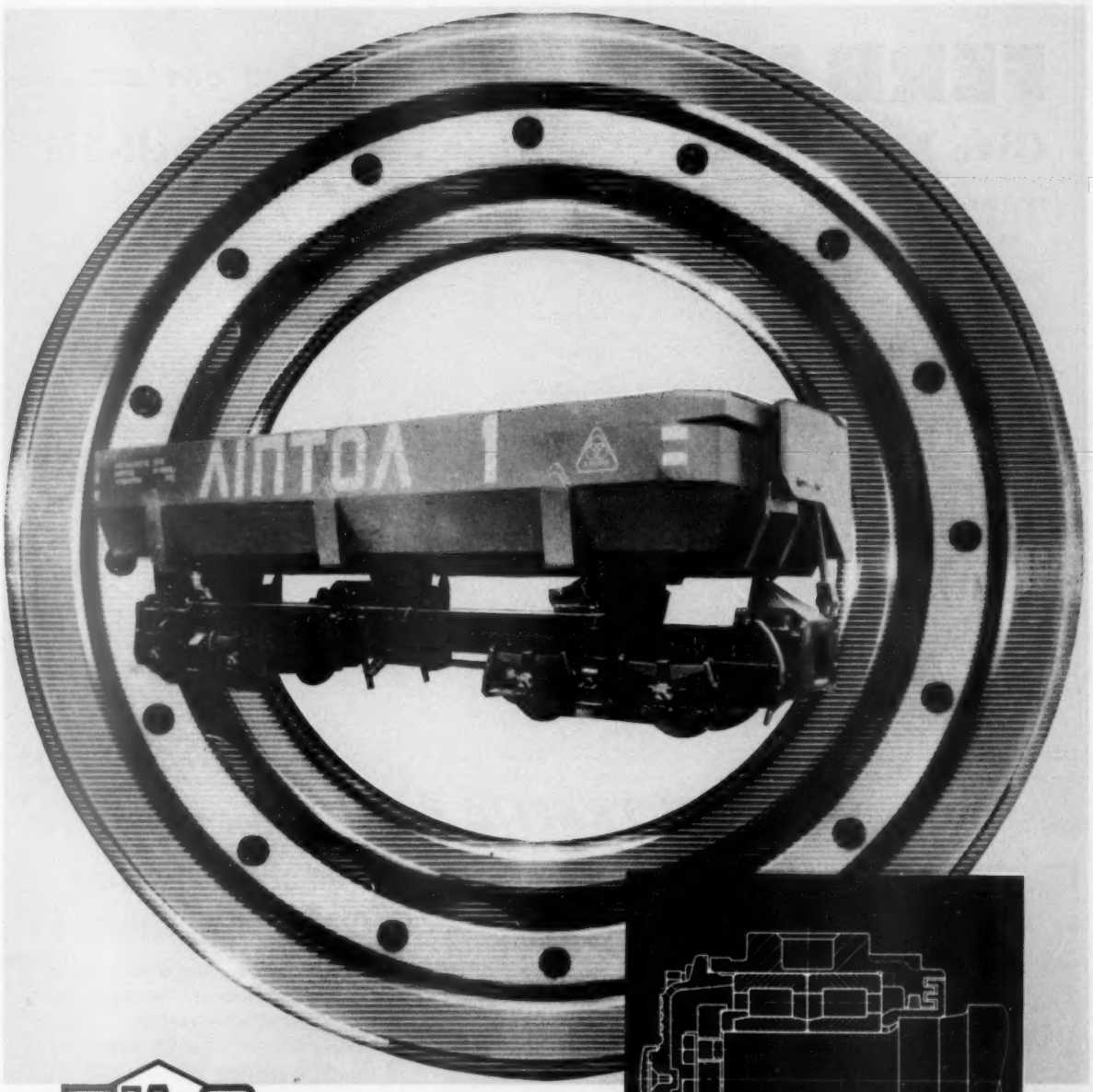

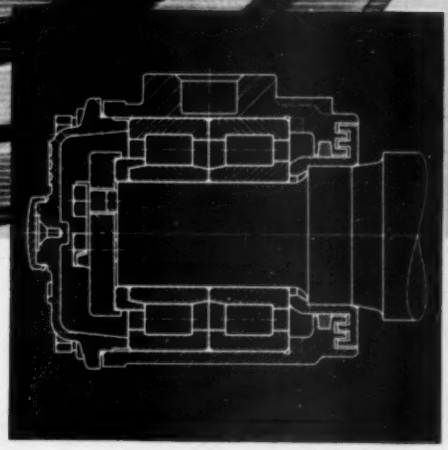

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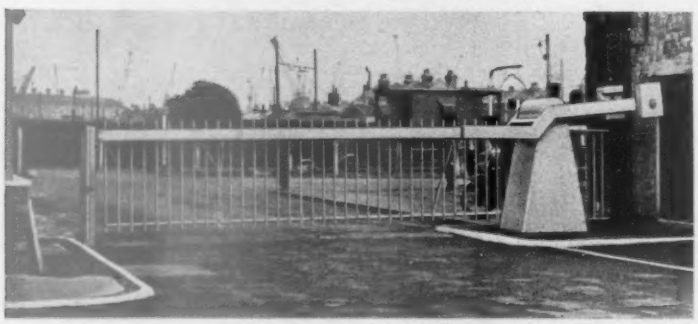

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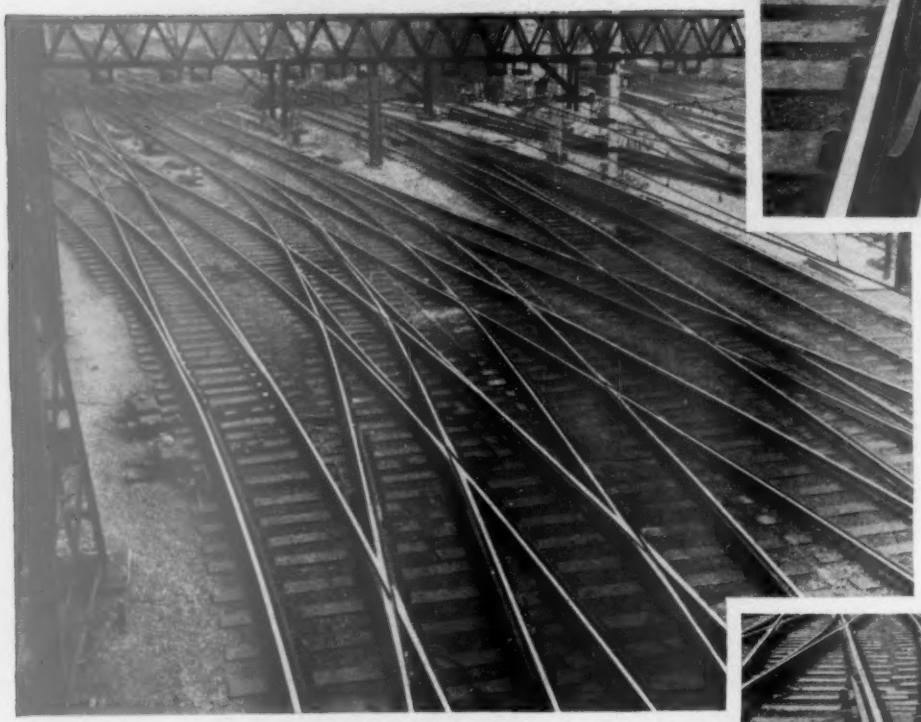
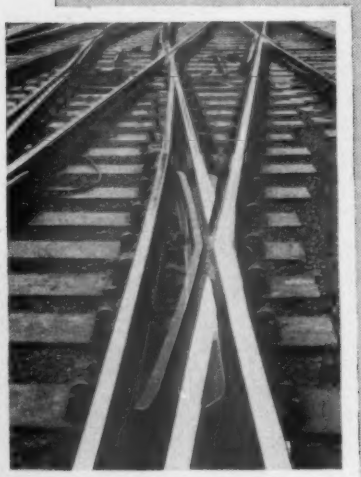
EDGAR ALLEN TRACKWORK at terminal stations in electrified areas



Cast manganese steel crossings at Liverpool Street Station.
Photographs by courtesy of British Railways, Eastern Region.



Obtuse cast manganese crossing

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A journal of Management, Engineering and Operation

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"People who care about railways"

THE DEBATE on the White Paper in the House of Commons on January 30 was notable more for its length than for the knowledge it disseminated of the Government's intentions as to the future of the transport industry in this country. During the discussions it became clear, as we had suspected, that the Ministry was still hazy as to the shape and personnel of the future railway organisation. Mr. John Hay, the Joint Parliamentary Secretary to the Ministry, in his closing remarks made one point which we hope is significant. He said that, " when it comes down to brass-tacks the ordinary man working on the railway will be glad that at last he will be run by people who really care about the railways and who are much more closely in touch with him and his problems than is now unfortunately the case." Just what that means only time can tell, for the White Paper, as such, does not necessarily say anything of the kind. Some of the suggestions we have made in relation to the White Paper would go some way to ensuring that this was so. We accept the assurance given by Mr. Hay, although it may seem to be against the evidence, that the Minister " is not anti-railway." Probably, it is far nearer the truth to say that nobody at the Ministry concerned with railways is anti-railway, but that it is at a loss to know what to do to promote the well-being of railways. It might be that the answer to this problem is to put the railways in the hands of people who know railways, to abstain from any action which would prevent the railways from being run as an economic unit and to support those in charge of their management without fear of temporary political consequences. That may be asking a lot in a political atmosphere, but it is probably the right answer over a period which may be longer than any Government cares to look.

Fares discrepancy

MR. HAY pointed out that when one compared figures of fares with other indices of prices and wages since 1938, there was a considerable discrepancy to the disadvantage of railways. Between 1938 and 1959 the average level of fares had advanced by 150 per cent, whereas the cost of living had increased by 181 per cent, and the index of weekly wage rates had improved by 208 per cent, but he did not point out that one reason against an upward adjustment of railway fares and charges during that period had been Government interference with a proposed advance. Neither did he point out that when the Commission had been prepared to fight against further labour costs it had been deterred by governmental advice. Whatever happens under the new set-up, whatever shape it may take, the railways will have capital liabilities of about £400 million. This compares with the net capital liabilities of the Commission at the present time of about £2,000 million. This point was not made clear in our comment last week and to get the records straight we would point out once more that some £400 million of the greater sum is attributable to non-railway activities and is to be transferred to the new boards which are to be set up. Of the remaining £1,600 million which relates to railways, about £400 million is attributable to losses of which there is no prospect of recovery. It is, therefore, to be written off. Another £400 million will rank as an interest-bearing loan on normal terms. The remainder is to be placed to suspense account and carry neither fixed-interest or fixed-repayment obligation. The new capital of British Railways, therefore, is to be £400 million. That should seem to be a realistic figure, but only if the railways are to be given an opportunity to conduct their affairs economically and commercially.

British diesel engines in the United States

W. H. DORMAN & Co. Ltd., in signing a 20-year agreement with Fairbanks-Morse & Company of Chicago to sell British diesel engines throughout the United States, expects to earn $5 million a year within three years. The total earnings for 1961 alone will exceed $1 million. W. H. Dorman, one of Britain's oldest independent high-speed engine manufacturers, has agreed to supply Fairbanks-Morse with basic diesel engines fitted with fuel injection equipment in the 40-h.p. to 700-h.p. range. They will be shipped to the United States after bench testing and there fitted with American-made filters, dynamos, piping, and so on, at the Fairbanks-Morse diesel engine works

in Beloit, Wisconsin. The Dorman "L" and "Q" series engines, those covered by the agreement, are an ideal complement to the engines already manufactured by Fairbanks-Morse. This enables W. H. Dorman to compete in a power field in which vast opportunities exist. Dorman engines are already widely used in North America. They also power several vital telecommunications links across Canada and South America.

High-power Bo-Bo electric locomotive

IT SEEMS likely that the 71 h.p. per ton of locomotive weight of the new Bo-Bo type electric locomotive now on order for the Swiss Federal Railways will set a world record in locomotive power/weight ratios. The nearest approach is probably the 58½ h.p. per ton of the French National Railways BB16000 class, of 4,920 h.p. and 84 tons weight, as compared with the 5,600 h.p. and 79 tons weight of the forthcoming Swiss type. The output of 1,400 h.p. by each motorised axle is also extremely high, although nearly equalled by that of the S.F.R. 1 Do-Do 1 class introduced in 1941, of 5,540 h.p., or 1,385 h.p. per motorised axle; but the latter is a rigid-framed and not a double-bogie type. As described elsewhere in this issue, the new locomotives will be of such remarkable compactness that their length over buffers, 48 ft. 6 in., will be identical with that of the existing 2,500-h.p. Swiss Re 4/4 locomotives, also of the Bo-Bo wheel arrangement, which since their introduction in 1946 have done such admirable work on the high-speed cross-country trains between Geneva, Lausanne, Berne, Zurich and Basle.

Automatic level crossing barriers

THE FIRST automatic barriers to be used by British Railways are now in operation at Uttoxeter in the London Midland Region. This installation, described elsewhere in this issue, is the result of a considerable period of negotiation to secure both operating economies and alleviation of road traffic conditions. In 1956 a party of officers of the Ministry of Transport and the British Transport Commission visited Holland, Belgium, and France, to report on the latest Continental practice in level crossing protection with regard to securing economies and reducing road traffic delays, without prejudice to safety. As a result of this report the B.T.C. Act of 1957 was passed empowering the Minister of Transport to authorise special safety arrangements, such as automatic or remotely operated barriers, at public level crossings. The barriers cover the left-hand side only of the road and the London Midland Region, assisted by the A.A., R.A.C., County police, and education authorities, has undertaken an intensive publicity campaign to inform road users, and particularly children, of the operation and usage of these crossings.

Overseas railway traffics

CANADIAN Pacific Railway gross revenue for the month of December, 1960, amounted to $34,723,889 compared with $39,175,349 in December, 1959. Railway expenses amounted to $30,618,127 ($34,707,247) resulting in net earnings of $4,105,762 ($4,468,102). Aggregate railway revenue for the year ended December 31, 1960, amounted to $457,105,482 ($477,805,874). Salvador Railway Company receipts for November, 1960, amounted to colones 171,000 compared with colones 218,000 in November, 1959, a decrease of colones 47,000. Aggregate receipts from July 1, 1960, amounted to colones 680,000 compared with colones 838,000 for the corresponding period of 1959. Traffic returns of the West of India Portuguese Guaranteed Railway Co. Ltd. continue to show a considerable improvement compared with the previous financial year. At January 20, 1961, the end of the 29th 10-day period, total returns were contos 23,056, an improvement of contos 3,729 compared with the corresponding period of 1959-60. Estimated road and railway receipts for the Midland Railway Co. of Western Australia Ltd. for November, 1960, amounted to £A96,290 (A£75,175).

British locomotive industry portrayed

THE GREAT variety of motive power supplied by the British locomotive industry is made clear in the volume "British Locomotives." This well-illustrated production by the Locomotive & Allied Manufacturers' Association is the subject of brief notice on page 157. Modernity, the satisfaction of the present needs of railways in widely differing environments, is the keynote. The part played by British builders in providing diesel and electric motive power under the British Railways modernisation plan is skilfully outlined. So also are developments overseas, and the locomotives, multiple-unit trains, and railcars delivered from Britain to meet the widely differing needs of railways in every continent; and the many types of locomotive used in British industrial plants. The principles of recently-developed forms of diesel and electric traction are clearly described with good explanations of reasons for their use. The evolution of the industry is outlined with due attention to the earlier history of electric and diesel haulage.

Canadian National's new look

THE MAPLE leaf, emblem of the Canadian National Railways since 1937, is being superseded by a new symbol, a continuous line forming the letters CN. This is to remind the public of the continuing improvements in all spheres of C.N.R. activity, more especially since 1950. A survey by the railway's Public Relations Department in 1958 showed that the Canadian railway industry was felt to be unprogressive and slow to improve performance and services. The public believes only what it sees. The $1,000 million investment in C.N.R. modernisation, in the words of Mr. C. A. Harris, the company's Director of Public Relations, has been lying "like an iceberg, mostly beneath the surface." The new symbol is the focal point of a re-design programme. Around it new colour schemes and designs are being devised for stations, motive power and rolling stock, publications, uniforms, and so on. As Mr. Harris has stated, no industry can afford to develop its product without giving attention to the package in which the product is marketed; visual re-design simply means "re-styling our package to suit and do justice to the contents."

New Shell-Mex film

THE SECOND film in the Industrial Notebook series of Shell-Mex & B.P. Ltd.—"An Industrial Notebook on Iron and Steel"—combines a miscellany of items about the iron and steel industry with some interesting applications, both old and new. The film shows the first iron bridge in the world and the furnace which was used for smelting the iron used in its construction; it also shows railway lines cast in 1767 and, in contrast, the modern laying and welding of 300-ft. lengths in continuous track on British Railways. Other contrasts are provided by shots of old steam engines still in use, a giant dragline removing spoil at the rate of 1,600 tons an hour, and examples of the modern use of steel in buildings, bridges, and railway electrification. Made by Random Film Productions Limited, the film is available in 35 and 16 mm. through the Shell-Mex & B.P. Film Library from June 1.

Tilbury-Gravesend ferry service

MANY new innovations have been incorporated in the design of the three new vessels which are to replace the present fleet which maintains the Tilbury-Gravesend passenger ferry service of British Railways, Eastern Region. The preliminary design was prepared by the Shipping & International Services Depart-

ment, British Transport Commission, in conjunction with the Continental Traffic & Shipping Manager, Eastern Region. Six gangways, three at each side, are fitted to the vessels for speedy embarkation and disembarkation of passengers. Each gangway is of the hinged folding type, hydraulically operated and controlled from the bridge. It is believed that these are the first gangways of this type to be installed on any vessel. VHF/RT equipment is installed in each vessel for navigational purposes during periods of poor visibility, for communication with the shore radar station at Tilbury. The vessels, built by Whites Shipyard (Southampton) Limited, bear the names of their predecessors, *Rose II*, *Catherine II*, and *Edith II*.

To Greece by car/sleeper

ADVANTAGE is being taken by railways of the tedium and risks of long-distance motoring. A growing number of motorists is beginning to appreciate the comfort of car/sleeper trains, and more of these are being introduced. The Italian State Railways, in conjunction with the Wagon-Lits Company, is to run a weekly car/sleeper train next summer between Milan and Brindisi, where it will connect with vessels of the Adriatica and Hellenic Mediterranean Lines to and from the Greek mainland ports of Igoumenitsa and Patras. Leaving Milan by car/sleeper train, which will include sleeping cars and *couchettes*, at 12.30 a.m. on Monday, passengers with their cars will sail from Brindisi at 10 p.m. the following evening, and be due at Igoumenitsa at 9.30 a.m. and Patras at 6.30 p.m. on Tuesday. At Milan there will be connections with car/sleeper trains from Ostend, in conjunction with the sailings from Dover, and Paris. The traveller from Britain can reach Athens in three days with a pleasant variety of transport, and the long journey through Jugoslavia and Macedonia, over some bad roads, is avoided.

Road haulage price control in France

LONG-DISTANCE road transport in France will be subject to Government price control from July 1. Freight rates will be able to vary between upper and lower limits, as they already do on the French National Railways. This is one of the reforms recommended in the Rueff-Armand report which pointed out that the railways could not fairly compete with the roads if road hauliers had freedom to undercut railway freight rates. The Government's aim is to co-ordinate rail, road, and water transport, fixing prices on the basis of costs so as to make the most economic use of all three methods. Agricultural products will be exempt from the new control of freight rates, as will coal and scrap iron. Road hauliers will also be allowed to give special cut rates to their largest customers if they get the approval of the Minister of Transport.

British Railways standard electrification system

THE inclusion of a large scale electrification at 25 kV. 50 cycles in the British Railways modernisation plans has necessitated a very considerable programme of tests and theoretical calculations regarding the effects to be expected on all circuits in the vicinity of the lines to be converted to electric traction. A very full description of this research and results so far obtained was given in a paper entitled " Experience with the British Railways standard electrification system, with particular reference to signalling and telecommunications," read by Mr. A. W. Woodbridge, Chief Signal & Telecommunications Engineer, British Transport Commission, before the Institution of Railway Signal Engineers on February 8. In introducing the paper, the author states that, from past experience, interference with all communication circuits in the near vicinity of a line electrified with the new system can be severe. Also, as the rails are to be used as return conductors for the traction current, a further study will have to be made of the track circuit. It is fortunate that very considerable theoretical and practical information has been collected over the last 50 years, both in relation to the effects of electric traction and of high-voltage power transmission lines. This information has enabled a set of limits to be imposed on the voltages expected to be induced in circuits paralleling the railway and to set restrictions regarding length of track circuits. Mr. Woodbridge explains that many of the anticipated effects and limits it has been required to impose have already been dealt with in considerable detail in papers contributed by other authors. The object of his paper, he states, is to describe how the 25 kV. a.c. electrification systems are performing in practice and to explain the comprehensive series of tests carried out. Also to compare the results so obtained with the standards set at the beginning of the engineering work. The author describes in detail the system tests that have been evolved to obtain the latest information on the problems expected. When the decision to use the 25 kV. 50 cycles system of electric traction was made it was evident that it was fundamentally possible to design a traction system, and one or two were working in other countries. The conditions under which the tests were applied differed from those applicable here and, therefore, the results obtained are not to be taken as necessarily correct for this country. It is necessary to investigate the whole scheme on a more systematic basis than has been done elsewhere. The British Transport Commission engineers, with the collaboration of the C.E.G.B. and South of Scotland Electricity Board, the G.P.O., and the various makers of equipment, have participated in inaugurating what is known as system tests. These are designed to cover both normal and abnormal service conditions as well as fault conditions. The state immediately before and after each test is also recorded so as to obtain the greatest value from the results obtained at a particular instant. Mr. Woodbridge deals in great detail with the various types of measurements made, results obtained, and equipment used. In conclusion, he states that the tests are not yet complete and do not necessarily cover the maximum loads that might be expected. Also short-circuit conditions have yet to be investigated. It is necessary to determine the probable maximum traction current and also, no direct harmonic analysis had been possible at the time of the system tests because of non-delivery of the measuring equipment. It is therefore not possible at this stage to form any conclusions regarding modifications to the present methods of screening and track circuit immunisation.

Pre-stressed concrete bridging in India

THE first pre-stressed concrete bridges built in India were on the Assam Rail Link in 1949. They were designed for metre-gauge main-line standard and consisted of girder spans with cross-timber sleepers but no decking. The bridges consisted of seven 65-ft. spans with 6-ft. 1-in. deep girders and six 44-ft. spans with 4-ft. 7-in. girders. They were cast at site, the Freysinnet system of pre-stressing being used. This railway was constructed against time without opportunity for extensive preliminary preparations. The cross sleepers were secured directly to the girders with ¾-in. holding-down bolts, an arrangement that did not prove very satisfactory.

Consequently it was decided to adopt a design for subsequent spans embodying a ballasted trough reinforced-concrete slab deck to ensure transverse rigidity and a more evenly-supported and elastic track. A general-outline design was standardised leaving individual railways and tenders free to decide such dimensions as depth and width of beam to suit local conditions and the system of pre-stressing.

This procedure ensures competitive tendering and avoids discrimination in favour of any particular system as well as ample lateral stability and a minimum of impact and vibration in the concrete. No indigenous Indian system of pre-stressing has yet been developed.

The Railway Designs & Standards Organisation has evolved a design of pre-stressed concrete slab for 20-ft. spans on both 5-ft. 6-in. and metre-gauge lines. Meanwhile, the use of 30-ft.,

40-ft., and 60-ft. pre-stressed spans on different railways of both gauges is expanding rapidly. There are now in service 193 5-ft. 6-in. and 355 metre-gauge spans of these larger sizes.

Competitive tendering has proved quite successful and four different pre-stressing systems have been used, namely, Freysinnet in 173 spans, Lee-McCall in 82 spans, Gifford Uddall in 287 spans and Magnel Blaton in six spans. Many 12-ft. and 15-ft. pre-tensioned slab spans have also been erected.

The comparative costs of plate-girder and pre-stressed concrete spans have been worked out as follow:—

Span	5-ft. 6-in. gauge		Metre gauge	
	Plate girders	Pre-stressed C.	Plate girders	Pre-stressed C.
	Rs.	Rs.	Rs.	Rs.
30 ft.	10,300	14,225	8,500	9,000
40 ft.	15,400	15,388*	13,000	14,800*
60 ft.	35,000	28,354*	26,500	24,000*

* Average figures.

It must be remembered that from the Indian finances point of view the concrete structures have the great advantage that they have hitherto used much less imported steel and have therefore involved less foreign exchange than the corresponding steel spans. There is also the consideration that maintenance charges are much lower than in the case of steel bridges.

In view of the standard of Indian labour and subordinate supervision the whole problem of pre-stressed bridging is specially complex in that country. Furthermore, many technical details are engaging the attention of Indian engineers, such as the behaviour of pre-stressed concrete in shear, the effect on the steelwork of water trapped in the concrete, stress, corrosion and fatigue. In fact, they realise that pre-stressed concrete is not an unmixed blessing for the following reasons.

The control and supervision necessary to ensure the quality of the concrete and the correct positioning of the cables or wires have to be of a high order. The grouting and proper covering provided over the cables have to be most carefully watched. For instance the grout from one cable duct has been known to flow through an adjacent one, showing that the intervening concrete was either porous or cracked.

It is fully appreciated that because of the high live and repeated dynamic loading on railway bridges great caution is necessary in deciding whether or not to use pre-stressed concrete for the comparatively-longer spans.

Wind-tunnel research

IN our issue of February 3 an editorial note briefly outlined the activities of the Japanese Railways Technical Research Institute. They are allocated to a number of "laboratories," each with its own staff. Only a portion of the work of this staff is carried out in the precincts of the laboratory itself, much of it being on full-scale experimental work at different points on the railway system. One of the laboratories is known as the Disaster Prevention Laboratory and has a moderate staff of 14, considering the extent and variety of the investigations undertaken. Its main task is to consider the best means of protecting the railways from natural disasters, such as storm, flood, and snow. But it also studies artificially-created conditions, notably train wind-resistance, air-currents and ventilation in tunnels and wind-pressure on pantographs and trolley wires.

In the field of wind- and snow-study subjects, other than those mentioned above, are included aerodynamic problems of a tunnel for high-speed trains, natural wind-pressure near ground on embankments and cuttings, pressure of snow on slopes, the mechanism of avalanches, afforestation to mitigate snowstorms, and the protection of slopes by planting vegetation.

This laboratory has two wind-tunnels: (1) of the N.P.L. type for ascertaining the effects of artificial snowstorms, and (2) a so-called small one for studying wind-pressures. In the N.P.L. tunnel air is drawn in at the front through a 12: 1 contraction duct to a nozzle, there to enter the observation chamber which is fitted with glass top and side windows. Its main body is approximately 1 ft. square in section and 4 ft. 7 in. in length, but it can be extended to 12 ft. if necessary. A 7·5-h.p. electric motor-blower produces wind the velocity of which can be regulated from 0 to 25 m. per sec. Powder-supplying equipment using fine white powdered zinc oxide or magnesium carbonate is fitted to simulate blown snow.

This tunnel has been installed for ab. ut 10 years, and in the main has been used for experiments to combat snowstorm effects. Problems investigated have included the relative width, height, under-branch height, and density, and the effectiveness of existing forest or of new plantations and the pattern of planting. Also the efficacy of snow fences, whether erected normally or obliquely to the direction of the wind and for cornice protection. Elaborate studies with special anemometers have also been made into the influence of embankments and cuttings on wind.

The small wind-tunnel measuring about 2 ft. 2 in. square in section and 8 ft. long was constructed in 1957 for investigating the air-resistance of trains and other structures. Special care is taken to provide an air-current free from disturbance by installing a long wind path with several metal filters for adjusting the current and expanding the contraction ratio of 9·5: 1. Its blower is driven by a 30-h.p. electric motor and produces wind velocities of from 5 to 45 m. per sec. All aspects of train wind-resistance have been carried out in this tunnel. This laboratory is also responsible for research into snow-loading of structures and slopes in a new R.C. building containing −10 deg. C. and −50 deg. C. low-temperature chambers and an open-roof chamber for collecting falling snow; it is not yet in full-scale use.

The C.P.R. in 1960

DIESEL haulage of all trains on the Canadian Pacific Railway was made possible last year by delivery of 45 units, though some steam locomotives are retained as a reserve. This is one development in 1960 mentioned by Mr. N. R. Crump, President of the C.P.R. Company, in his review of the year. Now that steam had disappeared on the Canadian National Railways, practically all traffic in Canada is worked by diesel power.

Installation of C.T.C. was extended over more than 100 miles of track. Good progress was made in the Pacific Region with installation of radio communication between locomotive and brake van. Six fixed wayside stations were also radio-equipped to facilitate movement through the mountainous sections of Western Canada. Extensions were made to the radio and loudspeaker facilities in marshalling yards in Toronto, Smiths Falls, and Montreal. Work progressed at Agincourt, near Toronto, where a large electronically-controlled hump retarder yard, similar to the St. Luc yard of the C.P.R. in Montreal, is to be constructed.

The economic recession, Mr. Crump states, resulted in a smaller demand for transport and in lower freight revenue. This decrease is accounted for largely by the reduced activity in construction which prevailed throughout most of the year. Reduction of unremunerative passenger services continued during the year. The decrease in passenger train revenues was proportionately much less than that in train mileage. The more important trains between large cities continued to attract passengers. The transcontinental service, provided in part by the fast streamline train the "Canadian," with its stainless steel stock, including a scenic dome observation car, produced more than half the company's passenger revenue last year. This shows that there is a large public for this attractive mode of long-distance travel.

The expansion of piggy-back services indicates the possibilities of such traffic over long distances and on lines with an ample loading gauge. The C.P.R. dealt with 110,000 road vehicles on flat wagons in 1960, compared with 101,600 in 1959. The number of such wagons used for this traffic is now 1,130, an increase of 290 during the past 12 months. New wagons

of this type were among 1,600 ordered in 1960. Terminals for piggy-back traffic were opened in Hamilton, London, and Windsor, Ontario, and North Edmonton during the year, bringing the number to 32, ranging from Saint John, New Brunswick, to Vancouver. As this method of transport continues to grow, Mr. Crump stresses, his company is developing new techniques to meet the needs of consignors. Flat wagons have been equipped for operation in passenger trains between Vancouver and Edmonton, affording second-morning delivery at either end of the run. Inspection and servicing of refrigerated and heated road vehicles on C.P.R. wagons was extended west of Winnipeg.

Hearings before the Royal Commission on Transporation continued throughout the year and the report of the Commission is expected to be completed by March 31. Until then, action to lighten the burden on the railways of the statutory rates on grain and grain products must be delayed. The strike of non-operating railway unions, which was to have begun on December 3, was averted under an Act of Parliament providing for the continuation of the operation of the railways until May 15, 1961.

Communications facilities operated by the C.P.R. continued to grow during the year. Among the innovations was the joint Canadian Pacific-Canadian National operation of a high-speed public facsimile Wirefax service between Montreal and Toronto. The first of its kind in Canada, this instantly transmits and reproduces an exact copy of typed or handwritten matter. Extension is planned as demand increases. Other C.P.R. communications facilities, including Telex, were well patronised. The result of unofficial shipping strikes in Britain and Canada last summer was that the C.P.R. ocean steamships ended the year with a loss. Increasing competition and high operating costs adversely affected the British Columbia coastal steamer services. Canadian Pacific Air Lines international passenger and cargo traffic increased, but enforced limitations of trans-continental services continued to affect revenue. Hotel operations showed an improvement over 1959.

The C.P.R. has developed a working integration of transportation data collection and processing over a very broad field. With much of the basic paper-work now full mechanised, the emphasis is on refinements to provide varieties of information for management purposes. In rolling stock control 100,000 records, of stock on C.P.R. tracks and of the company's stock on foreign railways, are received daily. These are analysed and assembled for traffic and accounting purposes at various levels and for Government reports. Expanding demands have taxed the capacity of the high-speed electronic computer, believed to be the most powerful in the world in the service of a transport undertaking, and its replacement by a transistorised computer, six times faster internally, is planned.

New York rapid transit problem

THE difficulties and complications of working suburban traffic between New Jersey and Manhattan have increased. The deficits of the several railways running from the outer suburbs of New Jersey to the Hudson River waterfront are reported to have grown, as has the congestion on the roads on both sides of the river. The general situation has not been improved by the attitude of the Port of New York Authority, owner of various bridges and some of the tunnels. It has consistently refused to commit its bondholders by entering the field of acquisition of or assistance to the privately-owned suburban railways.

The Port Authority agreed recently to purchase the Hudson & Manhattan, a nine-mile line consisting mainly of eight miles of double-tube tunnels under the Hudson and terminating in the business centre of Manhattan. The Authority prepared to offer $20,500,000 for the H. & M. line and the land it owned in Manhattan, but also to lay out nearly $50,000,000 in modernising that property. The offer stipulates (*a*) statutory assurance that the Authority's responsibility for commuters would be confined to the H. & M. existing system; (*b*) transference of the present running-powers of H. & M. stock over Pennsylvania Lines between Jersey City and Newark; and (*c*) the linking up of the H. & M. lines with those of the Jersey Central RR. with the aid of running powers over the Lehigh Valley tracks to reach the Pennsylvania station at Newark. This would enable all the commuter traffic at present entering Manhattan by ferry to be handled by the H. & M., as the latter already has connections with the Erie-Lackawanna lines.

To enable the H. & M. to carry so greatly increased a volume of traffic the Port Authority proposes to purchase 300 new coaches at a cost of $30,000,000. Modernisation of the tracks, signalling, terminals and other property would cost from $10,000,000 to $20,000,000 it is estimated. The trustees of the H. & M. property have yet to agree to the offered purchase price, but there is no doubt that if this deal can be effected the acute and constantly deteriorating problem of carrying workers from the New Jersey suburbs into and out of the business centre of Manhattan will be appreciably reduced.

Revision of railway statistics essential

BY A CORRESPONDENT

WHEN a new organisation for operating British Railways comes into force, a vitalised set of traffic statistics will be required to replace the tables hitherto published in *Transport Statistics*. That series of 13 numbers a year has recorded traffic volume and gross receipts for each four-week period and four times a year added operating results for 12 weeks, without a clear declaration of expenses and net earnings. These are precisely the figures which will tell taxpayers what the burden of maintaining British Railways will mean to them in future.

In late years less was known in London about the financial state of our 18,560 miles of railway than about the position of the U.S.A. system, which comprises 107 Class 1 railroads, operating 220,000 miles in freight service and running passenger trains on about 100,000 miles. With unfailing regularity the Association of American Railroads circulates a monthly statement of railway revenues and expenses. The return for October last was dated December 12. It gave for that month and for the first 10 months of 1960 operating revenue from freight, passengers, mails, parcels and other services. Set against these receipts were operating expenses, divided under the heads of transportation, traffic (commercial business), maintenance of way and structures, and maintenance of equipment.

The figures showed that in October the U.S.A. railway system operated at a ratio of 77 per cent and had a net operating revenue of $191 million. Taxes of all kinds totalled nearly $88 million, while debits for equipment and joint facility rents amounted to $33 million. The railroads were left with a net railway operating income (earnings before charges) of about $70 million, an increase of $2·8 million, or 4 per cent, on the October, 1959, figure.

Over the first 10 months of 1960 earnings decreased by $112 million, or 18 per cent. The A.A.R. statement gives revenues, expenses, and net railway operating income for each owning company at October 31. The Norfolk & Western heads the list with earnings of $55 million; the New Haven is at the foot with a deficit of $14 million; and if the Erie-Lackawanna merger, which took effect in October, is to succeed, it must begin by wiping off debts of $5·6 million. The great Pennsylvania Railroad gained little more from 9,880 miles of road than did the Western Maryland from 840 miles.

The Association of American Railroads has no statutory authority over its member companies, but contrives to produce worthwhile statistics for all the far-flung U.S.A. lines. In comparison it will be a simple task for the British Railways Board to render a periodical account of the financial results in six Regions over which it has control.

LETTERS TO THE EDITOR

THE EDITOR IS NOT RESPONSIBLE FOR THE OPINIONS OF CORRESPONDENTS

PURCHASING IN NATIONALISED INDUSTRIES

January 23

SIR, In your issue of January 18, 1952, you published a letter in which I suggested that the final accounts of all the nationalised industries be linked or amalgamated so that the profit made by one at the expense of another could be used to offset the loss incurred.

Recent correspondence in various newspapers leads me to think that the climate of popular opinion would now be more receptive to this idea. As an instance, a Mr. W. H. Haughton, in a letter in the January 19 issue of the Daily Express, stated: " Neither the Coal Board nor the railways gain by these high prices, for each has to pay the other. In fact, nobody gains, but everybody loses. In any truly export-conscious country the two parties would either combine or enter into a barter agreement." Could not the re-organised nationalised railways exploit this situation?

Yours faithfully,

E. J. MURPHY

67, Chatham Avenue,
Hayes, Kent

THE UNCOLOURFUL SOUTH

January 24

SIR, How uninspiring are the main-line coaches of the Southern Region in their plain unlined green—efficient and serviceable no doubt, but just like soldiers in khaki battledress. And how sadly they contrast with the smart cream panels and coats-of-arms of the " Bournemouth Belle " and other Pullman trains, with the chocolate-and-cream of the Western Region's " Torbay Express," or even with London Transport's new aluminium stock.

Getting in a main-line express ought to be a little bit of an adventure; there should be some contrast between travelling and mere commuting. Some much-needed sparkle could be supplied if the Southern were at least to line out their main-line stock. And, better still, let them run a couple of specially-timed expresses with green lower and cream upper panels, or in the old L. & S.W.R. livery. It would be a cheap and paying advertisement.

Yours faithfully,

R. C. B. STILLMAN

68, Queens Road,
Richmond, Surrey

GLASGOW SUBURBAN ELECTRIC TRAINS

February 2

SIR, The Ministry of Transport inquiry, summarised in your January 6 issue, into the accidents in Glasgow suburban a.c. electric trains of British Railways, Scottish Region, did not find the root of the trouble. Some of the statements made are very naive.

It was said that on October 30, 1960, an explosion occurred in the leading guard's van of an empty six-car train at Charing Cross (Glasgow). Evidently nobody bothered to find out why the explosion occurred at all; all they were trying to do was to minimise the effect of the explosion. A fortnight later practically the same thing happened again. Again, nobody seemed to try to get at the root of the trouble. The much-talked of modification consisted of nothing else but a vent pipe, so that the blast of the exploding oil would go up into the air rather than into the guard's compartment. Things were left as they were until, on December 13, a transformer blew up. Little wonder that this happened despite the vent pipes fitted to the filling plug and the large holes in the roof of the guard's compartment. Again, it was stated that the cause of the explosion was the same: gases escaping.

What an incredible statement! The real cause, plain and simple, was a defective transformer and, more specifically, an inadequately designed secondary winding. Why not rectify this instead of fooling around with gas vents, holes in the floor, vent pipes, and so on?

Yours faithfully,

D. STEINER

Walchestrasse, 27,
Zurich, 6

BRITISH RAILWAYS MOTIVE POWER

January 28

SIR, Drastic modification of British Railways modernisation plan should be made in the vast expenditure on entirely unnecessary main-line diesel locomotives. It is fashionable to stress the shortcomings of the conventional steam locomotive; but one seldom hears of the disadvantages of diesel propulsion, of which four great faults, in ascending order of importance, are: (1) objectionable noise; (2) obnoxious smell; (3) low degree of reliability; and (4) economic disadvantages.

The first speaks for itself. The normal disagreeable growl of the diesel can become a nerve-shattering roar when the engine is being revved up, especially in the confines of a station. The " clean air " campaign makes much of smoke from a locomotive, which is comparatively rare nowadays; but it ignores the noxious diesel fumes. The stench in Euston or St. Pancras can be nauseating.

As to reliability, the recent incident breakdown of the Royal train merely threw into prominence what has become an almost everyday occurrence on lines where diesels are used, to a far greater extent than was the case with only steam operation. A steam locomotive may on occasion suffer defects, and small wonder considering the shameful lack of maintenance; but it rarely becomes a total failure, and usually manages to proceed with some loss of time. When a diesel fails it usually does so completely. The more successful types of diesel can perform well, to the disadvantage of steam locomotives employed on the same jobs; but the difference is not so marked as to justify the enormous increase in expenditure involved.

From the economic aspect even the U.S.A. railroads at last are realising that the diesel is not the attractive proposition it was first claimed to be. It is a great pity that British Railways seems unable to benefit by American experience. It seems impossible to obtain reliable figures of relative costs of steam and diesel operation; but I can see no justification for the purchase, at enormous capital cost, of diesels, and for the high maintenance expenditure on them, when they do work which could be adequately done by steam engines with many years of useful life ahead of them. It is far better to devote this money to electrification. When diesels were first introduced for main-line work we were told that their use could only be justified on a limited scale when it was practicable to evolve rosters which afforded continual use; but this seems to have gone by the board. No country has less excuse for abandoning steam traction than Britain, which has no natural oil supplies, no water power, and no shortage of locomotive water.

Yours faithfully,

H. C. CASSERLEY

Ravensbourne,
7, Castle Hill Close,
Berkhamsted, Herts.

The Scrap Heap

Advice to designers

"The successful locomotive was not based upon an imitation of an elephant."—*Hiram Maxim.*

New appointments

Two elderly horses, Mary and Charlie, were used until recently for shunting duties in the goods sidings at Diss station, British Railways, Eastern Region, but have now been superseded by a diesel engine. The station staff feared that they would lose the animals. Happily this has been averted, as employment has been found for them assisting with the laying of new tracks in the sidings.

The Government and the railways

". . . it is the duty, as it is the right of government, to exercise a salutary influence and control. But this influence and control must have reference solely to public objects. We must have no dabbling with internal management, no clique of well-paid officials, with Government names and armed with Government authority, thrusting itself into every department of railway management, and, as all such cliques invariably do, monopolising the whole power, and disgusting and disregarding those practically acquainted with the details of management and personally interested in the prosperity and good working of the concern. We regard all Government committees and commissions with positive distrust and dislike."—*From "The Railway Gazette & Mining Chronicle" of September* 11, 1847.

Spirit of Christmas

"I have travelled all over the world and nowhere have I experienced anything like the courtesy and efficiency of British Railways," thus spake the middle-aged lady who made a collection on behalf of the driver of a Southern Region train on Christmas Day. When the astonished driver was presented with the proceeds—£9—he stammered "Nothing like this has happened to me before."—*From a letter in the "Sunday Express."*

Bulgarian venture

A hundred years ago three brothers, the Barkleys, all civil engineers, steamed into Varna Bay . . . to begin work on the first railway connecting the Danube with the Black Sea. . . . Henry Barkley was astonished by the lack of curiosity on the part of the Turks, who would not even look at the passing locomotive. On inquiring he found that the whole thing was considered to be an English trick by which a strong young devil was trapped in the big firebox on wheels and made to turn a crank. A great worry was the locals' inability to realise the speed of the train. . . . A passenger jumped from the moving wagon because he wanted to speak to a friend, and another to pick up a pipe he had dropped. The peasants could still less understand why a train could not stop at once, and they would drive a flock across the line and be vastly indignant at the slaughter of their cattle. So the line had to be fenced with posts and rails, but often the timber proved too much of a temptation. The Barkleys were full of admiration for the skill of the English engine driver. . . . The fitters were another matter. "Such gentlemanlike, enlightened dogs, always thinking about their own importance, the rights of labour and the oppression of capital. . . ." Henry admitted to being prejudiced against the type, after being told while lying working under an engine that "it was not fitting to ask a fitter to hand him a pick, as there are different branches of labour and he could not touch a navvy's pick."—*From "The Times."*

John Braithwaite's London house

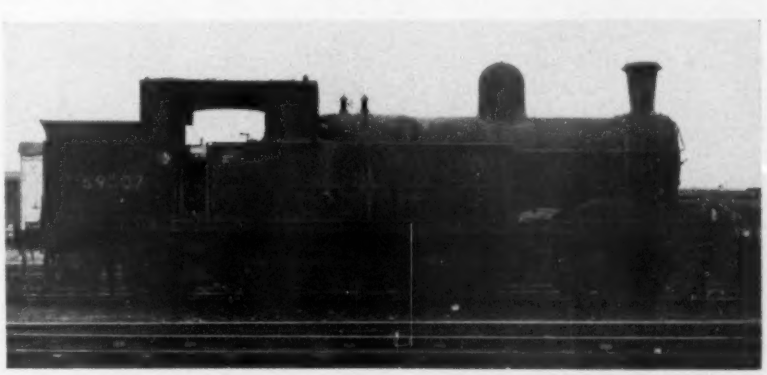
The Georgian house, No. 4, Bath Place, Euston Road, London, N.W.1, once the residence of the engineer, John Braithwaite, restored by Car Mart Limited in 1953, is now threatened with demolition by road widening schemes. It is understood that steps are being taken to preserve the commemorative plaque, and to re-erect it as near as possible to the site. Braithwaite (1797-1870) is best known perhaps as the engineer who laid out the Eastern Counties Railway and chose the 5-ft. gauge for it. His reason for a gauge only 3½ in. more than standard was a need for more space between locomotive boiler tubes; but the E.C.R. engines were built with boilers no larger than those used on 4-ft. 8½-in. gauge lines. He was joint founder and editor of *The Railway Times*, now incorporated in *The Railway Gazette*. His many inventions include (with Ericsson) the locomotive *Novelty*, which competed in the Rainhill trials on the Liverpool & Manchester Railway in 1829; and also forced ventilation of the House of Lords, and the first efficient steam-operated fire engine.

Service with a smile

I caught the 9 a.m. Kings Cross/Newcastle train last Monday and changed at York, leaving my umbrella on the rack. I told a porter at York and collected the umbrella at Hoe Street Station, Walthamstow, on Thursday afternoon.—*A letter in "The Evening News."*

Last of its class

The last of a class of mixed-traffic 0-6-2T engines of the former Manchester Sheffield & Lincolnshire Railway was withdrawn from service in the London Midland Region, British Railways, on December 31. Locomotive No. 69307 of British Railways Class 2 (L.N.E.R. "N5") was one of 129 built between 1891 and 1901 whilst T. Parker was Chief Mechanical Engineer of the M.S. & L.R., which became the Great Central Railway in 1897. Fifty were constructed in the company's works at Gorton and the remaining 79 by Beyer Peacock & Co. Ltd. No. 69307 was built in 1898 by the latter firm and was numbered 767 when first built; it was re-numbered twice by the London & North Eastern Railway, and given its present number in 1949, after nationalisation. The coupled wheels are 5 ft. 1 in. dia., total weight in working order 62 tons 7 cwt., and tractive effort 18,781 lb. at 85 per cent boiler pressure.



The last locomotive of a class designed for the M.S. & L.R. by T. Parker

OVERSEAS RAILWAY AFFAIRS

FROM OUR CORRESPONDENTS

NEW ZEALAND

Holiday travel

Although detailed figures are not yet available, railway passenger traffic in New Zealand over Christmas and New Year is thought to have created a record. An innovation that proved an outstanding success was a daylight Limited Express between Wellington and Auckland, running to a tight schedule and proving a boon to people travelling with children to holiday resorts.

WESTERN AUSTRALIA

Great Southern Railway rehabilitation

Upgrading of the 280-mile Great Southern Railway is now well advanced. The section between Spencers Brook and Narrogin has been completely re-laid with heavy 82-lb. welded rail and metal ballasted. Sections of the 20 miles of line between Albany and Wansborough also have been re-laid and this section will be completely re-laid by the end of the current financial year. Work is now in hand on the re-laying and re-ballasting of the 20 miles of line between Narrogin and Piesseville and it is expected that this section will be completed by June, 1961. At that time there will remain approximately 80 miles of re-laying and 180 miles of re-ballasting to completely rehabilitate the entire Great Southern Railway to the same high standard of the Eastern Goldfields Railway and the South Western main line. Providing funds are available, this work could be completed by 1963.

USSR

Moscow-Rome through sleeping cars

Through sleeping cars between Moscow and Rome are to be included in the 1961 summer service. Cars will contain two-berth and three-berth compartments. Bogies will be changed at the Russo-Polish frontier and break-of-gauge at Brest. The route will be over the U.S.S.R., Polish State, Czechoslovak State, Austrian Federal, and Italian State Railways, *via* Brest, Warsaw, Katowice, Bohumin, Breclav, Vienna, Villach, Venice, Bologna, and Florence.

AUSTRIA

Palletisation

The Federal Railways pallet service is being extended. The standard pallet used is 1,000 by 800 mm. At the end of 1960 some 60 regular customers were using the pool of 80,000 pallets. To minimise movement of empties, consignors of loaded pallets immediately receive at the goods depot empties in exchange. The Austrian Federal has joined the German and Swiss Federal Railways in the European Railway Pallet Pool. The cost of palletisation is heavy, largely because of the need to renew pallets, but the greater facility in providing door-to-door service is felt to compensate this. Opposition from railway staff, based on fears of redundancy, has disappeared, as the advantages are made apparent of less arduous work in depots and of the retention and increase of traffic by rail.

CZECHOSLOVAKIA

Modernisation plans

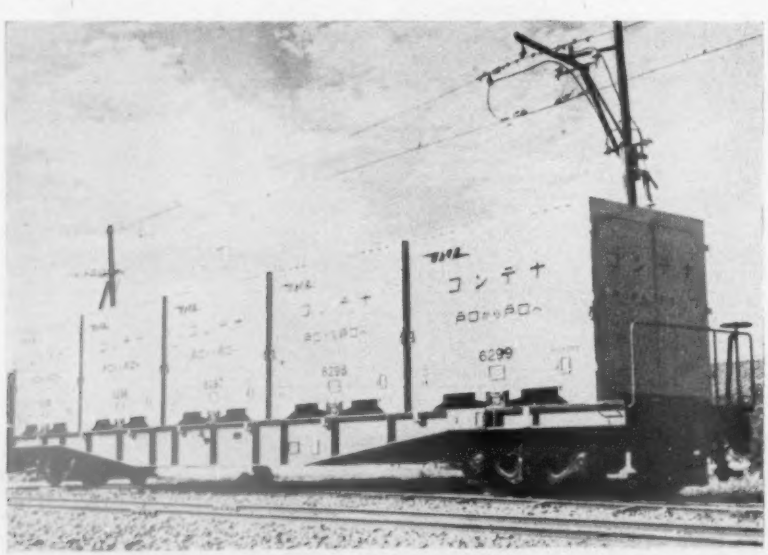
By 1965, 15 per cent of the State Railways lines with the heaviest traffic will be electrified and 52 per cent of all trains will run on those lines. Twenty-three per cent of rail transport will be operating with diesel locomotives and 25 per cent with steam. By 1968 it is expected that almost all the steam locomotives will have been dispensed with. The re-loading station at Cierná-on-Tisa, on the Czechoslovak-Soviet border, will be modernised and, in addition to reconstruction of the railway junction at Prague, new junctions will be built at Bratislava and Kosice (Slovakia). During the period of the 1961-1965 economic development plan, automatic safety devices are to be installed on another 790 km. of track and an automatic stop system introduced on 3,100 km. in all.

UNITED STATES

Swing-span bridge modification

The 265-ft. double-deck rail-and-road swing-span of the bridge over the Harlem River Ship Canal has now been replaced by a 304-ft. double-deck vertical-lift span. Both old and new spans carry three railway tracks on the upper deck, but the number of traffic lanes on the lower deck has been increased from three to six. The new span measures 80 ft. in width between centres of trusses and weighs 2,500 tons. The work of renewal was entrusted to the American Bridge Division of the United States Steel Corporation and the estimated cost is £4,600,000 including the lift-towers.

CONTAINER TRAFFIC ON JAPANESE NATIONAL RAILWAYS



Flat wagon loaded with five containers; one of 24 making up the express container train "Takara"

PUBLICATIONS RECEIVED

Dun & Bradstreet's Guide to Key British Enterprises, 1961. London: Dun & Bradstreet Limited, Adelaide House, London Bridge, E.C.4. 11¼ in. by 8¾ in., 807 pp. Price £6 16s. 6d., carriage free. This first edition contains short narrative descriptions of some 10,000 firms engaged in manufacture and distribution. In the first section they are listed alphabetically. Useful information includes addresses of London offices when headquarters are outside London, and indication of subsidiary companies as such. Classification in the second part is by trades. The six main groups include "manufacturing industries," which is divided into 18 sub-groups. One of the latter, "engineering and general machinery," includes a section entitled "railway engineers and equipment manufacturers, including manufacture and repair of locomotives, signalling equipment, wagons, and carriages."

British Locomotives. London: The Locomotive & Allied Manufacturers' Association of Great Britain, Locomotive House, Buckingham Gate, S.W.1. 10¾ in. by 8¼ in. 88 pp. Fully illustrated. Price 15s. This handsomely produced book, the subject of editorial comment on page 150, features the products, achievements, and evolution of the British locomotive industry. Many examples of British-built motive power on railways at home and overseas are illustrated in colour and monochrome. Sections are devoted to British Railways modernisation, notably the introduction of diesel and electric traction; modern motive power; evolution of the industry; railway modernisation overseas; locomotives in British industrial plants; and future prospects. A chart in colour shows the basic types of motive power supplied by member firms of L.A.M.A.

Barobox Steel Box Pallets. Characteristics of Barobox steel box pallets are briefly stated in a leaflet issued by the makers, Bahnbedarf-Rodberg G.m.b.H., of Lagerhausstrasse 17, Darmstadt, Germany. The firm also supplies steel box pallets to specifications by the German Federal Railway.

AEI Engineering. Published by Associated Electrical Industries Limited, 33, Grosvenor Place, London, S.W.1. The first (January) issue of this well-produced monthly house journal, covering the interests of A.E.I. Limited as a whole, embraces a wide field in 48 pages. Articles by A.E.I. officials deal with high-voltage power transmission; 330-kV. switchgear for the Kariba hydro-electric scheme in Rhodesia; measurement of small objects; ships' radio emergency equipment; a prototype brushless a.c. generator, and silicon diffused power transistors. Recent products, with illustrations of applications *in situ*, are featured in an eight-page review.

Railway Locomotives. By J. R. Day and B. K. Cooper. London: Frederick Muller Limited, 110, Fleet Street, E.C.4. 7½ in. by 5 in. 144 pp. Illustrated. Price 9s. 6d. This straight-forward survey of the three forms of railway motive power will help the intelligent layman and also those engaged professionally in transport in fields other than mechanical and electrical engineering. It should be welcomed by the young aspirant to railway service. Steam locomotives, about which much has been written, are dealt with briefly. The chapters on the several kinds of diesel and electric locomotive contain good explanations of necessarily complex matters. The photographic illustrations, supplied by British manufacturers and by the British Transport Commission, are well chosen, and the many line drawings by Mr. M. G. Young are clear and helpful.

V.P.I. Coated Papers for Rust Prevention. An illustrated brochure issued by Leonard Stace Limited, of Gloucester Road, Cheltenham, describes the principles on which V.P.I. (vapour phase inhibitor) papers function in prevention of rust, and methods of application. The V.P.I. chemical, a product of the research laboratories of the Royal Dutch-Shell Group of Companies, is stated to render water non-corrosive and to vaporise, in a package, slowly from the coating on the paper and form a non-corrosive local atmosphere. Applications suggested for packaging with V.P.I.-coated paper include small tools, machine tools, steel wire, precision mechanisms and gauges, dies, gears, ball and other bearings, and electrical apparatus.

Impalco Aluminium extruded and drawn products. A booklet issued by the Imperial Aluminium Co. Ltd. (Impalco), a subsidiary of Imperial Chemical Industries Limited, shows the range of the firm's aluminium extruded and drawn products. Some dimensions are given as a guide. Applications of Impalco aluminium alloys illustrated include L.T.E. District Line cars built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd., with aluminium alloy frames and bodies; all-aluminium diesel railcars built by British Railways; and luggage racks, made from aluminium extrusions, manufactured by William McGeoch & Co. Ltd. and fitted in British Railways coaches. A catalogue of Impalco aluminium and aluminium-alloy extrusions gives particulars, in the first volume, of the standard range which is useful in general and constructional work. The second volume shows a selection of the many shapes for which dies are held. Inquiries should be addressed to the Imperial Aluminium Co. Ltd., P.O. Box 216, Witton, Birmingham, 6, or to the nearest sales office of I.C.I. Limited.

Tipdex Filing Cabinets. "Tipments," or compartments operating on a pivot instead of sliding drawers, are features of Tipdex filing cabinets. Saving in floor space is claimed as one of the advantages. Details are given in a leaflet obtainable from the makers, Tipdex Limited, Green Lane, Hounslow, Middlesex.

Auf den Schienen der Erde: Eine Weltgeschichte der Eisenbahn (*On the World's Rails: A World History of Railways*). By Erwin Berghaus, Munich: Süddeutscher Verlag München. 8¾ in. x 6 in. 368 pp. Illustrated. Price DM. 24.80. Besides outlining the history of railway development, the author deals in an entertaining manner with a variety of topics. Most people concerned with railways professionally or otherwise will find a good deal of interest. Some of Herr Berghaus' views are controversial, as on current trends in Asia. He has much to say on present-day railway topics. The illustrations, whether reproductions of early prints, "unusual" railways, or of new motive power, rolling stock, or structures in Europe, are of exceptional interest.

Pennine Journey. By William B. Stocks. Huddersfield: The Advertiser Press Limited. 8¼ in. by 5½ in. 98 pp. Illustrated. Price 5s. 6d. (by post 6s. 3d.). This is the third edition of a concise history of the railways, tramways and canals in a district of considerable transport interest, largely because of the many engineering structures necessitated by the topography. The story is well told and the text has been brought up to date with recent changes. The author's research was spread over 20 years. His book is the outcome of his belief that railway history cannot be dissociated from that of the earlier forms of transport such as pack horses, or of later developments such as tramways. A pleasing feature is the scraper-board drawings by Mr. J. P. Hanson, F.R.S.A.

SUSPENSION CHARACTERISTICS—II

Results of wedge tests show close correlation between theory and test results

Within the range of damping factor values (D = 0·2 to 0·4) usually encountered with railway vehicles, the effect of damping on the natural frequency of the system is small, the frequency of the damped system being 0·98 to 0·916 of the undamped frequency (Fig. 5) respectively. It should be mentioned that the foregoing considerations related to one-degree-of-freedom system only. The more complex systems comprising the primary and secondary suspensions were considered in part in (7) and in greater detail by Schuler (8).

Wedge tests

The results of wedge tests are in the following considered with the aid of a number of records obtained for representative bogie vehicles. Records obtained with a 25-ton railcar trailer, which had completed about 78,000 miles, are shown in Fig. 6. The 16·5-ton body is supported by helical bolster springs with a static deflection of only 2 in. under tare load, while the corresponding value for the laminated primary springs is 3·25 in. The physical length of the swing links is 13·5 in. but, as they are inclined at 7·5 deg., their effective length in this case is reduced to 6·8 in.

Results shown by analysis

The theoretical frequencies of the body bouncing and pitching on the bolster springs are 2·2 and 2·5 c.p.s. respectively, while the lateral frequency on the links is 1·2 c.p.s. An analysis of the records indicates that the frequencies of bouncing and pitching are about 2·3 and 2·4 c.p.s. respectively, while that of rolling is about 0·8 c.p.s., this corresponding to the lower swaying frequency previously calculated as 0·75 c.p.s.

It will be noted from the records that the primary suspension oscillates for scarcely one cycle and that the overall pattern of oscillations is mainly determined by the helical bolster springs. While with the former the damping is about 0·4 to 0·5 of the critical, for the latter it varies between 0·02 and 0·04 of the critical. The latter values are much too low but this is understandable, bearing in mind the relation between p, m, and c. (Fig. 1).* As a result, the overall damping is also too low, but this will be corrected by using suitable dampers in conjunction with the bolster springs ensuring a static deflection of at least 3·5 in. correspondingly lower natural frequencies and appreciably improved riding qualities.

Increase in damping

It should be mentioned that, as the result of tractive forces applied at the bolster check plates, particularly when accelerating or braking, the damping

* Included in Part I—please see issue of January 27 last.

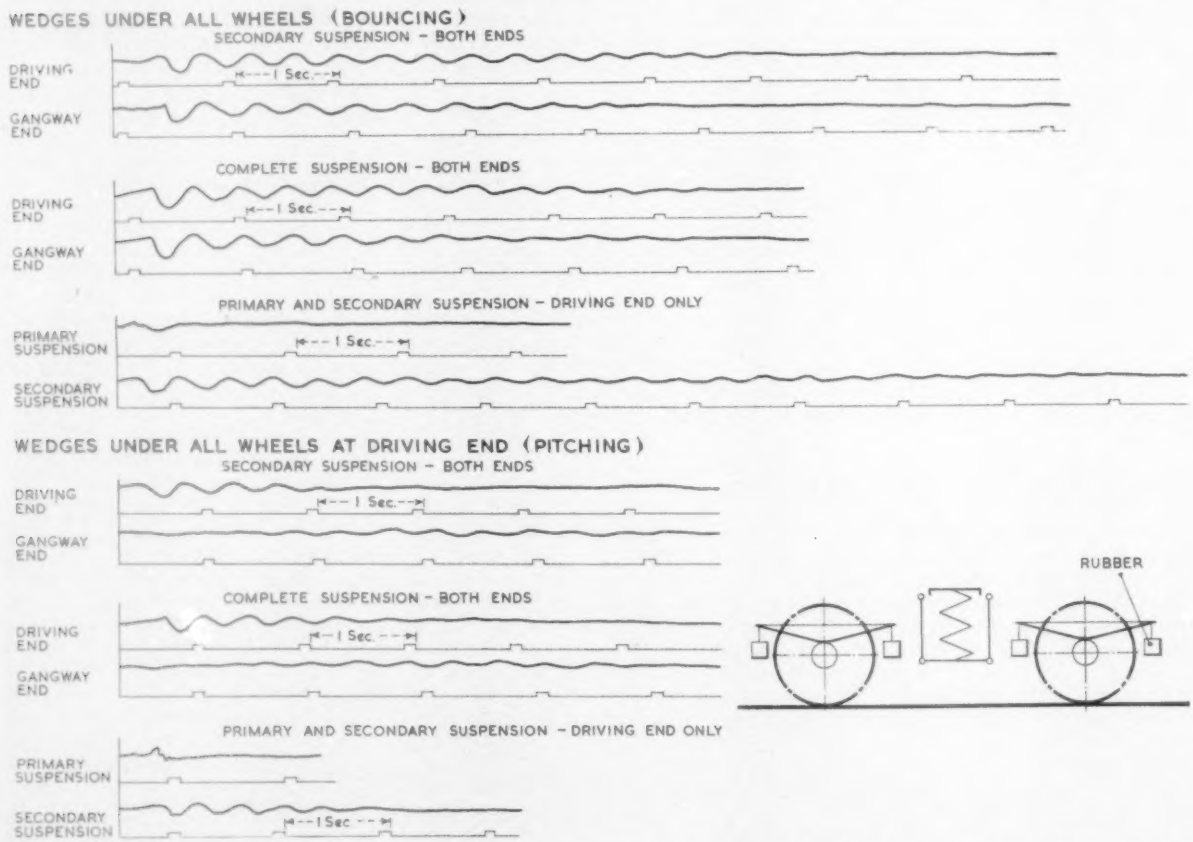


Fig. 6a—Results of wedge tests of a railcar trailer. The oscillations resulting from "pitching" excitation show the transfer of energy as indicated in Fig. 7

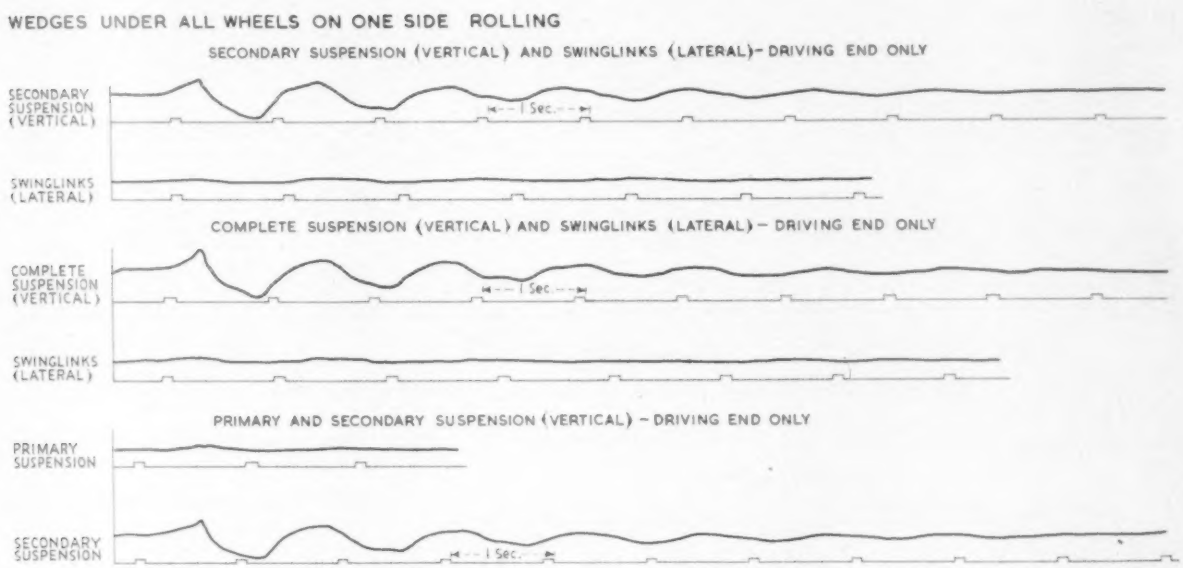

WEDGES UNDER ALL WHEELS ON ONE SIDE ROLLING
SECONDARY SUSPENSION (VERTICAL) AND SWINGLINKS (LATERAL)– DRIVING END ONLY
SECONDARY SUSPENSION (VERTICAL)
SWINGLINKS (LATERAL)
1 Sec.
COMPLETE SUSPENSION (VERTICAL) AND SWINGLINKS (LATERAL) – DRIVING END ONLY
COMPLETE SUSPENSION (VERTICAL)
SWINGLINKS (LATERAL)
1 Sec.
PRIMARY AND SECONDARY SUSPENSION (VERTICAL) – DRIVING END ONLY
PRIMARY SUSPENSION
SECONDARY SUSPENSION
1 Sec.

Fig. 6b—Excitation of "roll" oscillations produces action of superimposed oscillations apparent in shape of traces

can be appreciably increased, sometimes almost cutting out the spring action. This is one of the reasons why traction links between bolster and bogie frame are becoming increasingly popular.

Reliability of the method

The determination of the pitching frequency with the aid of wedges placed under all wheels of one bogie is not always entirely reliable. As will be noted from the records, at first the springs of the bogie concerned begin to oscillate and little takes place at the other bogie and then the conditions are reversed, the rear bogie bolster begins to oscillate, the front comes almost to a standstill, and so on.

This pattern became even more pronounced with the power railcar. This is caused by a periodic wandering of the energy, imparted by the impact received when falling off the wedges, from one end of the vehicle to the other (9).

The resultant motion can be regarded as the sum of the pitching ($f_1 = 2{\cdot}5$ c.p.s.) and bouncing ($f_2 = 2{\cdot}2$ c.p.s.) oscillations. To begin with both will keep in step but, as $f_1 > f_2$, the former will gain and advance ahead of bouncing as indicated in Fig. 7. Here, the front end is run over the wedges, the motion is split in two components—pitching and bouncing—and, as the former gains on the latter, the front end will become stationary and the rear will oscillate, the process repeating itself until the energy is dissipated by damping.

The 80-ton locomotive

The records relating to an 80-ton diesel-electric locomotive are reproduced in Fig. 8(a). The locomotive body weighs 52 tons and rests on helical bolster springs with a static deflection of 4·25 in., hydraulic dampers being provided across the springs. The swing links are 17 in. long inclined at 10·5 deg., this, in the present case, reducing the effective length to 10·4 in. Helical springs also are used for the primary suspension, the static deflection being 2·3 in.

Oscillations of bolster springs

Because of this, the suspension in terms of oscillations of the bolster springs, as well as bolster and primary springs together, must be considered. In addition, as the upper and lower bolster planks were not coupled together laterally, it was possible for the bolster springs to deflect laterally as well thus reducing the frequencies of nosing, rolling, swaying, and of lateral oscillations.

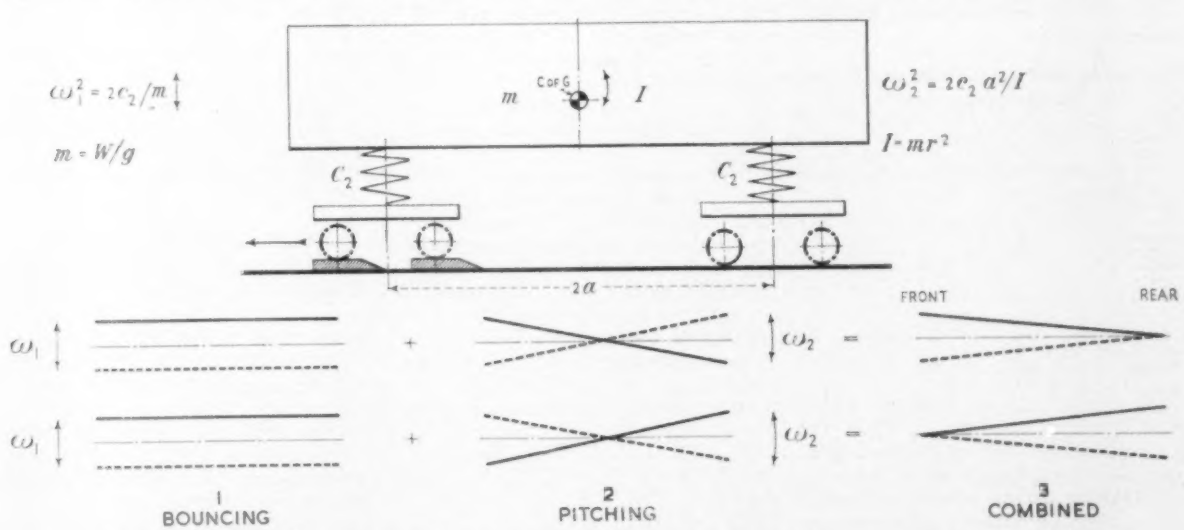


Fig. 7—Mechanism of energy transfer causing the pattern of oscillations which can be excited by "pitching"

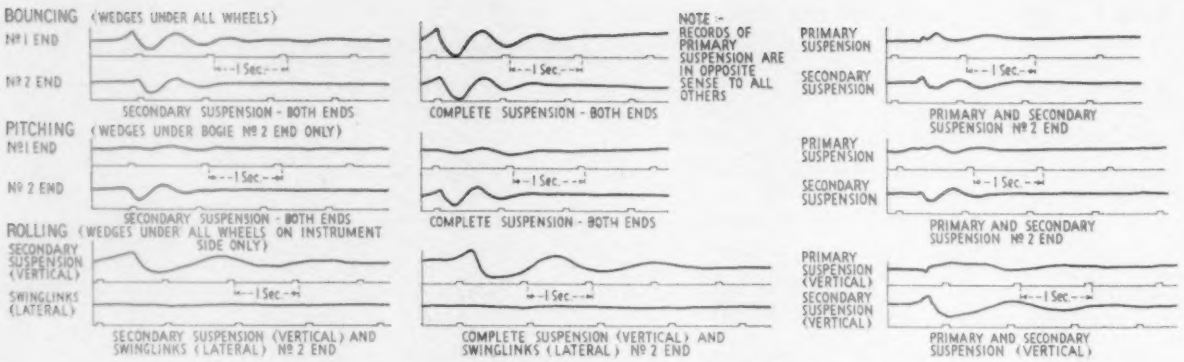

BOUNCING (WEDGES UNDER ALL WHEELS)
No 1 END
No 2 END
1 Sec
SECONDARY SUSPENSION - BOTH ENDS
COMPLETE SUSPENSION - BOTH ENDS
NOTE :- RECORDS OF PRIMARY SUSPENSION ARE IN OPPOSITE SENSE TO ALL OTHERS
PRIMARY SUSPENSION
SECONDARY SUSPENSION
PRIMARY AND SECONDARY SUSPENSION No 2 END
PITCHING (WEDGES UNDER BOGIE No 2 END ONLY)
No 1 END
No 2 END
SECONDARY SUSPENSION - BOTH ENDS
COMPLETE SUSPENSION - BOTH ENDS
PRIMARY AND SECONDARY SUSPENSION No 2 END
ROLLING (WEDGES UNDER ALL WHEELS ON INSTRUMENT SIDE ONLY)
SECONDARY SUSPENSION (VERTICAL)
SWINGLINKS (LATERAL)
SECONDARY SUSPENSION (VERTICAL) AND SWINGLINKS (LATERAL) No 2 END
COMPLETE SUSPENSION (VERTICAL) AND SWINGLINKS (LATERAL) No 2 END
PRIMARY SUSPENSION (VERTICAL)
SECONDARY SUSPENSION (VERTICAL)
PRIMARY AND SECONDARY SUSPENSION (VERTICAL)

Fig. 8a—Results of wedge tests of an 80-ton Bo-Bo diesel-electric locomotive

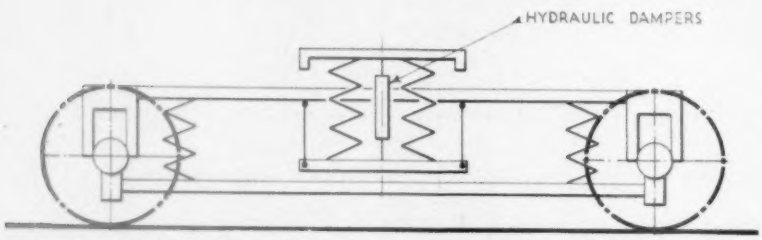


Fig. 8b—The difference in damping at the two bogies should be noted

The theoretically-determined frequencies are summarised in the following table, the data in brackets referring to values calculated allowing for the lateral flexibility of the bolster springs.

Calculated natural frequencies

Mode	Frequency c.p.s.		
Suspension	Primary only	Secondary only	Complete suspension
Bouncing	2·01	1·46	1·21
Pitching	2·35	1·8	1·48
Lateral		0·97 (0·78)	
Rolling		0·94 (0·94)	
Nosing		1·21 (0·975)	
Swaying		0·74/1·81 (0·58/1·83)	

The experimentally-determined values are given in the following table as summaries of three tests carried out for each set of conditions.

Natural frequencies and damping factor values: wedge tests

Mode	Frequency c.p.s.					
Suspension	Primary only		Secondary only		Complete suspension	
Loco. end	1	2	1	2	1	2
Bouncing		1·4	1·4	1·3	1·4	1·35
Pitching		1·34	1·4	1·4	1·32	1·42
Rolling				0·7		0·7
Lateral				0·6		
Damping factors						
Bouncing		0·3	0·15	0·3	0·3	0·2
Pitching		0·25-0·4		0·25		0·2
Rolling				0·2		0·2
Lateral				0·4(?)		0·4(?)

Comparison of the two tables suggests that the natural frequencies of bouncing and pitching are here determined by the action of both primary and secondary suspensions, while the experimentally-determined "rolling" frequency is really the lower swaying mode. The experimental lateral frequency, which is lower than that calculated, probably results from the action of friction forces at the hangers and bolster check plates, as is evident from the small amplitude of oscillations which makes evaluations difficult. The damping factor is of the right order, but the detected difference in values suggests that the wedge tests can be used to check the general conditions so far as vehicle damping is concerned, should riding qualities make its action suspect.

The results of Fig. 9 refer to a 104-ton locomotive with a 64-ton body resting on two six-wheel bogies. Helical springs with a static deflection of 3 in. are used for the primary suspension, while fully-elliptic springs with a static deflection of 3⅞ in. are employed with the bolster carried by 25⅝-in. long links. These are at an angle of 6 deg. 48 min. which in this case reduces the effective length to about 14-in.

The theoretical frequencies of the various modes are given in the following table. As before, the column "primary" refers to the primary suspension only being active, "secondary" signifying similar condition for the latter, while "overall" assumes both systems contributing to the pattern of oscillations. In the latter case, both bouncing and pitching have two natural frequencies, but here only the lower frequency is given.

Mode	Frequency c.p.s.		
Suspension	Primary only	Secondary only	Overall
Bouncing	1·8	1·6	1·2
Pitching	2	1·8	1·4
Rolling	1·35	0·8	
Swaying		0·7/1·27	

The evaluations of the wedge tests are summarised below.

Natural frequencies and damping factor values: wedge tests

Mode	Frequency c.p.s.		
Suspension	Primary	Secondary	Overall
Bouncing	1·73	1·78	1·73
Pitching	1·75	1·75	1·75
Rolling	0·8	0·8	0·8
Damping factors			
Bouncing	0·05	0·09	0·04
Pitching	0·05	0·08	0·04
Rolling	0·07	0·13	0·05

A comparison of the theoretical and experimental values suggests that the natural frequencies of bouncing and pitching are mainly determined by the helical springs of the primary suspension, this being substantiated by reference to Fig. 9, where the oscillations of the complete system are very similar to those resulting from the primary suspension. The damping factors are surprisingly low throughout, probably because the tests were carried out on a locomotive which had completed only about 5,500 miles. In addition, all gliding surfaces were well greased, while the clearances between bolster and check plates were appreciable. The half-eliptic leaf spring units of the bolster assembly profited from a well-chosen ratio of spring-leaf length L [in.], static deflection d [in.] and spring assembly height H [in.], which gave a ratio of $Hf/L = 5{\cdot}69 \times 1{\cdot}9375/36 = 0{\cdot}306$, while $H/L = 0{\cdot}158$ (1).

Dampers across primary springs

As already stated, the damping will be increased when pulling or braking. The use of dampers across the primary springs might be desirable here particularly if required to run over 60-ft. rails at speeds of about $V = 60 \times 1{\cdot}75/1{\cdot}467 = 71{\cdot}5$, or 36 m.p.h. The "roll" frequencies determined by placing wedges under all wheels at one side of the locomotive are referring to the lower swaying frequency as suggested by the "beat" effect particularly of the first half oscillation.

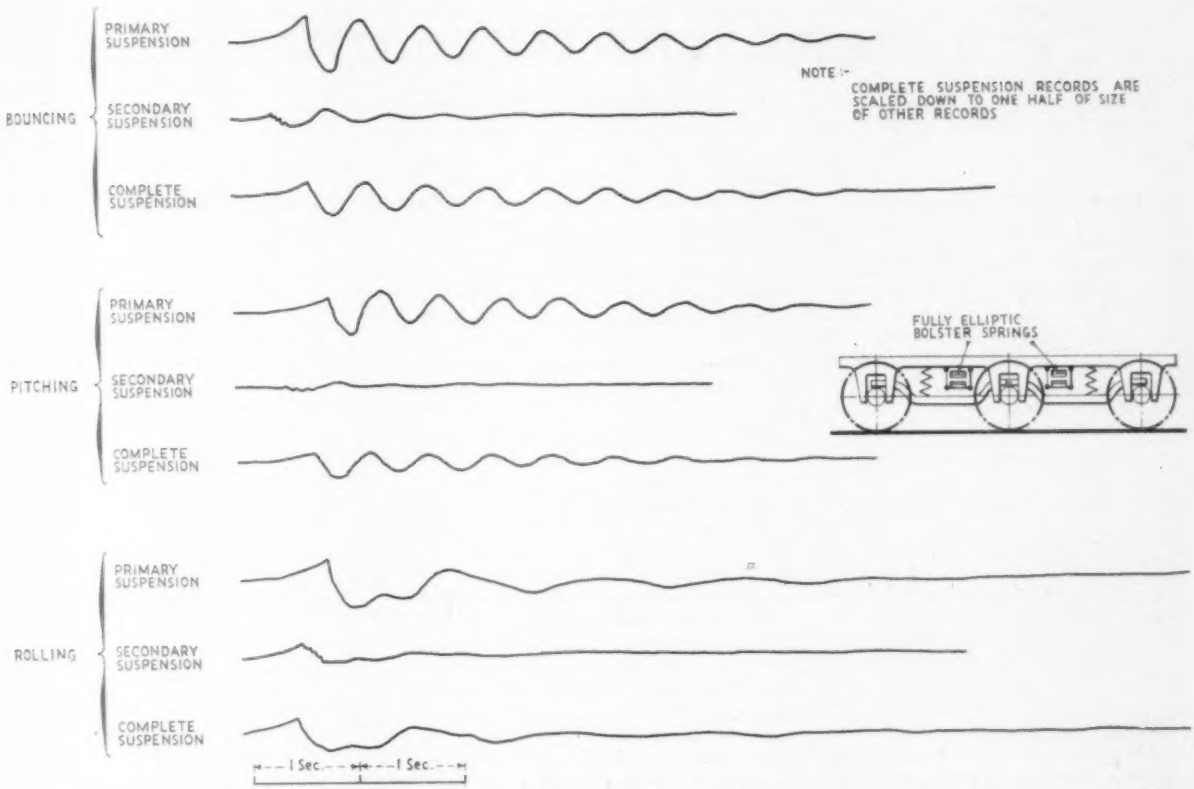


Fig. 9—Results of wedge tests of a 104-ton six-wheel bogie locomotive. The controlling influence of the primary suspension (helical springs) and the low damping are of interest together with the pattern of the "roll" oscillations

The suspension performance of a 78-ton electric locomotive is shown in Fig. 10. In this case, the body weighs 40 tons and rests on half-elliptic bolster springs with a static deflection of 3·2 in., while the helical springs of the secondary suspension ensure a deflection of 2·75 in., friction dampers being provided between bogie frame and axlebox. Particular care was taken with this design to ensure free lateral motion of the bolster, the half-elliptic springs which support the latter being secured to the frame via well-lubricated links while rubber bushed rods secure the assembly fore and aft. The physical length of the links is about 12·5-in. but, as they are at an angle of 7 deg., their effective length in this

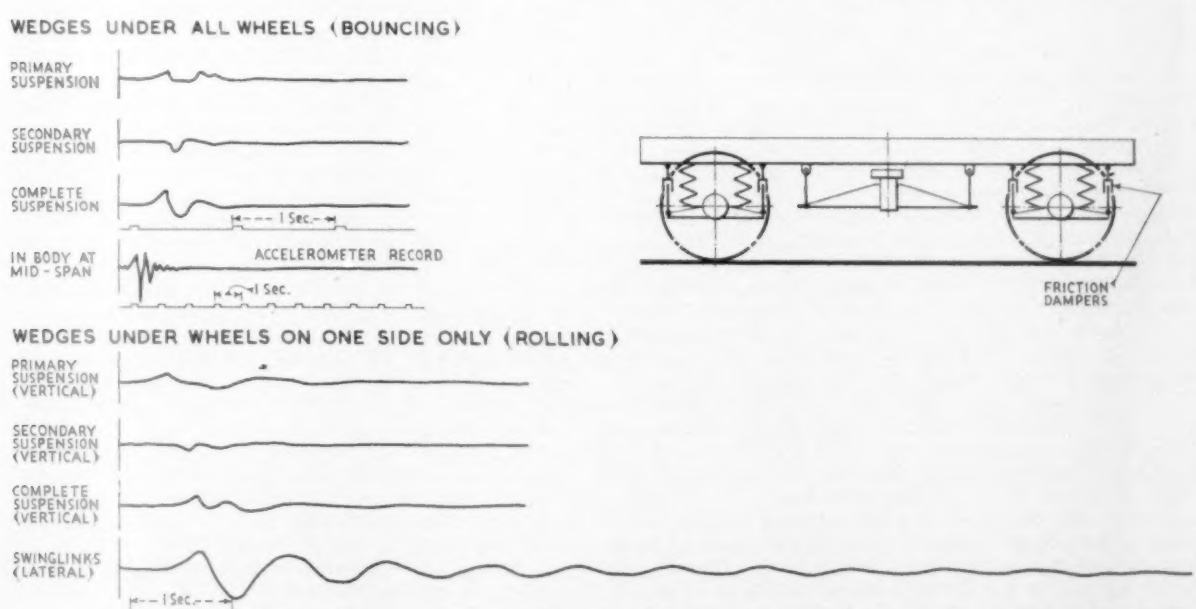


Fig. 10—Results of wedge tests of a 78-ton Bo-Bo electric locomotive. The liveliness of the swing links is a particular feature

instance is reduced to about 8·25-in.

The calculated natural frequencies as well as the experimentally-determined frequencies and damping factors are summarised in the following tables, while typical test results are reproduced in Fig. 10.

Calculated natural frequencies

Mode	Frequency c.p.s.	
Suspension	Primary only	Overall
Bouncing	2·43	1·4
Pitching	2·7	1·7
Lateral		1·1
Nosing		1·3
Swaying		1·15/3·4

Wedge tests

Mode	Frequency c.p.s.		
Suspension	Primary	Secondary	Overall
Bouncing	2	1·8 to 2	2·1 to 2·7
Rolling	0·9	0·9 to 0·95	0·93 to 0·97
Lateral	Swing links		1·04

Damping factors

Bouncing	0·4	0·5	0·3
Rolling	0·2 to 0·3	0·2	0·2 to 0·3
Lateral	Swing links		0·06 to 0·07

Thus, the natural frequency of bouncing is determined by the primary suspension while the damping of the secondary suspension is rather on the high side, resulting in a slightly high damping for the entire suspension. The scatter of natural frequencies probably results from the somewhat erratic action of the friction forces. The lateral damping at the swing links is too low and hydraulic dampers were fitted between bolster and bogie frame to ensure a damping factor of about 0·3 to 0·4 of the critical value so far as the nosing frequency is concerned.

In service, the primary suspension can be preoccupied with bogie pitching and this should be allowed for when interpreting the results of wedge tests.

It is hoped that these examples will serve to show that the required force-displacement characteristics of hydraulic dampers can be determined beforehand with reasonable accuracy. Before installing the finally-selected dampers, their force-displacement indicator diagrams usually obtained at a constant stroke and varying speeds (r.p.m.) should be presented and studied in terms of force-displacement velocity curves.

Displacement velocity

It should be mentioned that here displacement velocity is considered in terms of $\pi \times S \times$ r.p.m. where S is the stroke and not $2S \times$ r.p.m. It is generally desirable to record the damper diagrams directly in terms of force-displacement velocity as already done by a number of manufacturers and automobile builders. The final verification and, if necessary, adjustment should be carried out on prototype vehicles after completing wedge tests.

Natural frequencies and overall damping

This should show natural frequencies and overall damping, particularly in the vertical plane. Analysis of records of ride tests obtained with the aid of accelerometers and displacement meters should serve to provide clarity regarding predominant frequencies and displacement velocities and thus permit a close correlation between vehicle oscillations and damper requirements. The relevant fundamental considerations and allied calculations are simple and highly rewarding.

The problems become much more complicated when considered in terms of several degrees of freedom and couplings between the various modes of oscillations such as nosing, lateral oscillations and swaying, bogie pitching, and body fore and aft motion as well as the interaction between the bogies via the body and the ever-present problem of bogie hunting: the latter understood as the gentle or otherwise lateral displacement and rotation motion of the bogie down the track. These matters are under active consideration in many parts of the world and a " break-through " should be achieved before very long. The forthcoming mathematical formulations and solutions are likely to be complex relying mainly on the use of digital computers, at least before the interactions emerge more clearly.

Stodola's theories

This development must be faced in the spirit of the preface to the 1927 edition of the monumental work on " Steam and Gas Turbines " by a great engineering scientist and equally great teacher, the late Prof. Dr. A. Stodola. " In the long run, only scientific handling of all engineering problems is capable of securing the highest measure of progress and economy. To be sure, much can be achieved by purely empirical methods; a naturally gifted 'practical man' will be able to work more effectively than an inexperienced 'theoretician.' But it must not be forgotten that high price had to be paid for progress based on 'experience' alone. The initiated will know how certain manufacturers ran into a rut and fell out of the running because they had too long resisted using the better methods of modern development. The inveterate empiricist usually hides his embarrassment by contempt of everything scientific and of its representatives. On the other hand, we must guard against looking upon theory as the only cure-all of the manufacturer's difficulties. Reality is too complicated for us to be able to take account of the ramifications of the innumerable acting causes and to control them scientifically. We cannot dispense with experiment, whether it is performed initially to investigate a process of nature, or undertaken as a check on the preliminary theoretical investigations of science."

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8. Schuler, M., " Mechanische Schwingungslehre," Vol. II, Akademische Verlagsgesellschaft, Leipzig, 1959.
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A clear and stimulating introduction to some of the problems considered here is, apart from (9), to be found in the book " Examples in Mechanical Vibrations " by J. Hannah and R. C. Stephens published by Edward Arnolds Limited in 1956. This contains numerous fully-worked examples which add considerably to the understanding of the subject and the practical utility of the book.

Concluded

EDUCATION FOR THE EMPLOYEE

The Federation of British Industries Conference, " Invest in the Future," held in Buxton in September, 1960, discussed the problems of recruiting and developing managers, particularly for small and medium sized firms. Many small firms have had difficulty in keeping abreast with the changes in educational facilities since the war. Thus for them planned managerial development is a major problem.

The Federation has recently published a handbook entitled " Further education for those in industry and commerce," to bring up to date the many different aspects of further education as they concern the employer and trainee in his employment. The booklet deals with recruitment and training, types of technical commercial colleges and courses, the growth of part-time release, the Industrial Training Council, group training schemes, the financial aspects of further education and the employer's contribution in the promotion of further education.

A summary of the recommendations of the F.B.I. Conference is also included and a full report of this conference will be available in about a month. Copies of the handbook are available from the Federation of British Industries Print & Publications, 21 Tothill Street, London, S.W.1, at 6s. post free. The price does not include airmail postage.

ELECTRIC RAILWAY TRACTION SECTION

A.C. traction progress in India

THE increasing self-sufficiency of India in electric traction equipment and plans for further electrification were mentioned recently by Mr. H. D. Awasty, General Manager & Chief Engineer of Railway Electrification Administration. It would not be long, he stated, before India became " more or less independent of foreign help," and the Chittaranjan Locomotive Works had the manufacture of a.c. electric locomotives well in hand. He was speaking at the inauguration, on December 22, by Mr. Jagjivan Ram, Minister for Railways, of electric working at 25 kV., 50 cycles, of goods trains on the Asansol-Dhanbad section of the Eastern (former East Indian) Railway Grand Chord Line, and of the Pradhankunta-Pathardih branch, totalling 49 route miles. How soon self-sufficiency will be achieved is debatable. It was announced recently that the first electric locomotive to be built in India would be completed at Chittaranjan in a few months' time. During the Third Five-Year Plan, beginning next April, the works is to manufacture four 3,000-V. d.c. locomotives for the Eastern Railway lines in the Calcutta area, and Chittaranjan is also to build a.c. locomotives by the middle of 1963. It would seem that considerable reliance must be placed for some time on locomotives supplied from abroad, more particularly for the growing mileage converted at 25 kV.

A.c. electrification is to be extended as fast as possible, largely to facilitate movement of minerals and coal in implementing plans for industrialisation in Bengal and Bihar. The inauguration on December 22 marked completion of electrification at 25 kV. of the second group of lines in India on this voltage. Public service on the first a.c. lines began on August 11, 1960, over 47 route miles of the Rajkharsawan-Dangoaposi branch of the South Eastern (former Bengal Nagpur) Railway. British Insulated Callenders Cables Co. Ltd. were responsible for supply and erection of the overhead equipment, and the contract was completed within 12 months of being placed.

The Indian Railway Board, after long experience in India with electrification at 1,500 V. in the Bombay and Madras suburban areas, where it has proved perfectly satisfactory, decided early in 1957 that all future conversion should be at 25 kV., a.c. This was largely in the light of the technical and commercial success of French National Railways electrifications on this system carried out since the war of 1939-45. After the Bombay and Madras electrifications at 1,500 V. d.c., totalling some 240 route miles and effected between 1925 and 1955, no further conversion took place until in the Second Five-Year Plan period, 88 route miles of the Eastern Railway, from Howrah (Calcutta) to Burdwan, including the Tarakeswar branch, were converted in 1957-58 at 3,000 V. d.c. British manufacturers have played an important part in supplying motive power, rolling stock, and other equipment.

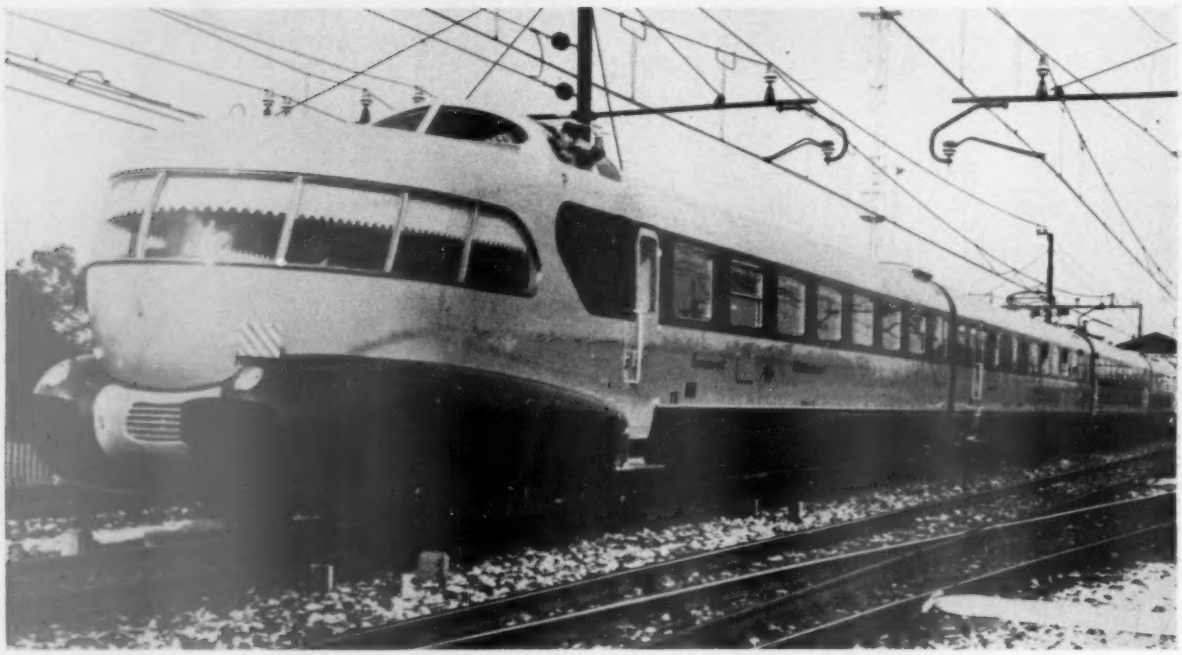
As regards a.c. traction, besides the 100 route miles now in operation, electric working on 40 more miles of the Eastern Railway, from Durgapur to Asansol and from Dhanbad to Gomoh, is to begin in the next two months. Conversion of about 150 route miles of the South Eastern Railway is almost complete; when these lines are energised in the near future, electric working will be possible of all traffic to and from the steel plants at Rourkela, Tatanagar, Burnpur, and Durgapur. The resultant improved service, including wagon turnround, will greatly assist industrial production. For that reason priority was given to electrification in this area as opposed, for instance, to Calcutta suburban lines in and out of Sealdah terminus. Under the Third Five-Year Plan the Railway Electrification Organisation under the direction of Mr. Awasty is in charge of all work in extensions of electrification on the Eastern and South Eastern Railways. It is to act also as technical consultant for the Southern and Central Railways. The organisation is to supervise design work for the Madras-Villupuram (metre gauge) conversion of the Southern and of that from Igatpuri to Bhusaval (broad gauge) of the Central Railways. In the case of electrification from Moghalsarai to Cawnpore, on the Northern Railway, which will be contiguous with electrification on the Eastern and South Eastern Railways, the field works also are to be done by the Electrification Organisation.

Investigation of section insulators

THE general trend towards higher speeds is one of the objects of electric traction. A speed of 87 m.p.h. already represents a normal service speed on some railways and, before long, electric trains and railcars will be running at a speed of 100 m.p.h. The design of section insulators presents several problems affecting the development towards very high speed. The section insulator serves the purpose of electrically dividing the overhead equipment into feed sections, both within station limits and on open track. Electric sectioning on high-speed main lines is carried out by providing overlap spans, which have less adverse affect on the pantograph than section insulators. Overlap spans can, therefore, be passed at higher speeds, though they cannot be used everywhere because of the length required for their construction. Section insulators are shorter and are therefore mainly used within station limits and, in particular, on crossovers between two pairs of switches. As the construction of modern switches permits their being passed at speeds up to 75 m.p.h., the development of section insulators capable of being passed at this speed also becomes a necessity.

The function of a section insulator consists of the electrical separation of two overhead equipment sections. In normal service conditions this implies that a section insulator is only subjected to those stresses originating from a potential difference caused by loads of the overhead equipment sections. In the case of a disturbance it may happen that one of the two overhead equipment sections becomes dead or earthed, which constitutes one of the two greatest electric stresses a section insulator should be able to sustain. In the first case, the traction current of a locomotive coming from a live overhead equipment section flashes-over the section insulator in the form of an elongated arc without this being quenched by the circuit-breaker in the sub-station ; in the second case, a locomotive passing a section insulator may encounter a short circuit amounting to several thousand amperes. The skids and insulating components of a section insulator should be able to sustain these great thermic and electric stresses. On the other hand, a section insulator should be of as light a construction as possible so that it may be passed at high speeds.

Comparative tests with section insulators have been carried out by the Office of Research & Experiments of the International Union of Railways for the purpose of obtaining useful indications for the development of new prototypes or the improvement of existing types. In the course of the tests the section insulators were examined in respect of their dynamic and electrical behaviour. The procedure adopted for carrying out the tests and the results achieved are the subject of a comprehensive report recently compiled. This gives a complete review of the present state of the technique in this field.

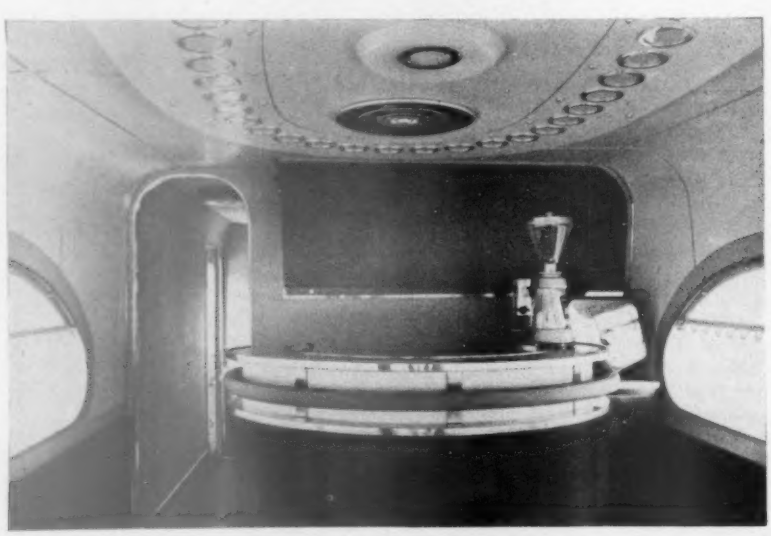


Italian State Railways electric train with four permanently coupled cars

FOUR-CAR LUXURY TRAINS for the Italian State Railways

High-speed with comfort and saving in weight per passenger afforded by Breda "ETR 250" trains

THE Italian State Railways four-car multiple-unit sets of the "ETR 250" series built by the Società Breda were placed in service last year on lines electrified at 3,000 V. d.c., to meet increased needs for fast luxury services between large centres over sections where high speeds are permitted.



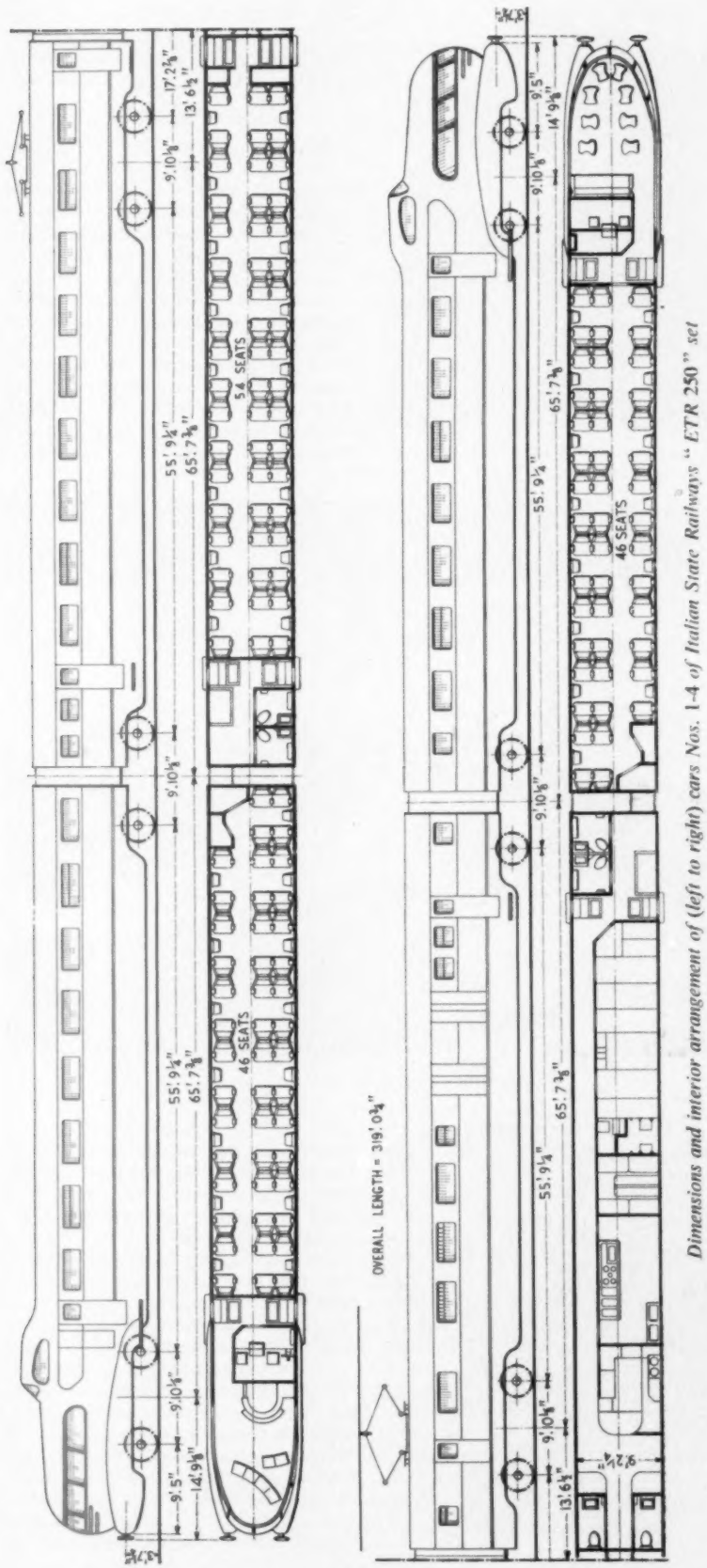
Bar in front end of car No. 1

Each set is formed of two twin articulated units, and seats 146 first class passengers, with meals service at seats. There are 46 seats in the first and fourth cars and 54 in the second. In the third vehicle are the kitchen, pantry, and accommodation for staff of the Wagons-Lits Company, which performs the catering; and for baggage, postal services, and radio transmission and telephone services. The observation lounge characteristic of the seven-car "ETR 300" trains, described in our issue of June 12, 1953, has been retained in the end of car No. 4, but the front end of car No. 1 has been adapted to include a bar. The positions of the motormen's compartments in the end vehicles are shown in the diagram. Furnishings and decor throughout the train are functional.

Body structure

The structural parts (frames, sides, ends, roofing, fairing, and buffing gear) are identical to those of the "ETR 300" trains. A special centre sill of welded thin steel plates forms the real backbone of each vehicle, and from it extend laterally numerous brackets supporting the floor, sides, and equipment. Each side is fabricated as one piece with a fairing which grips the lower part of the vehicle. Centre sill and fairing extend without interruption from pivot to pivot, but there the sill is tapered and the fairing is raised.

Normal construction is used for the roof, except that it houses large air-distributing channels and housings for filters and air-conditioners, and has inspecting lids for these. Scharfenberg couplers



Dimensions and interior arrangement of (left to right) cars Nos. 1-4 of Italian State Railways "ETR 250" set

are fitted between the two twin units, i.e., between the second and third vehicles.

Three of the six bogies are motor-equipped. The body suspension is of high flexibility with helical springs and hydraulic shock-absorbers. Transmission is by rubber pads, and the suspension of the traction motors is of tram type.

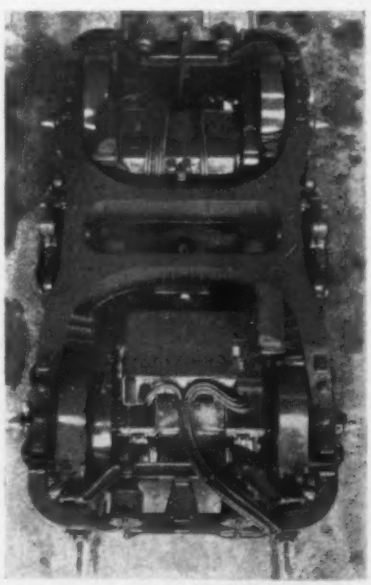
Traction motors

The six traction motors are of new design, with a one-hr. rating of 250 kW. and continuous rating of 200 kW. They are series excited with four poles with auxiliary poles and shunts for field weakening by means of the exclusion of windings up to 65 per cent. There are three combinations: series (of six motors); series-parallel (two sets of three); and parallel (three sets of two). There are thus, with five field weakenings for each combination, 18 speed ranges: six each in series, series-parallel, and parallel.

Interior fittings

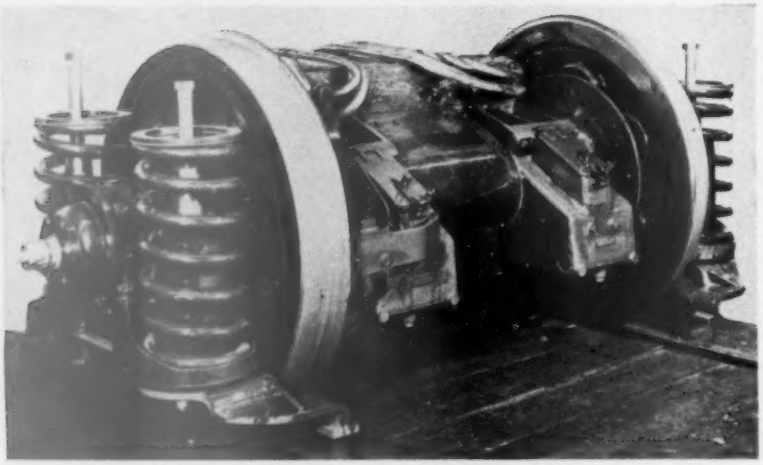
Each of the three passenger cars has seats at tables for two and four on each side of the gangway. Special springs are used for seats. Fluorescent light and conditioned air pass through the ceiling. There are two lavatories in each of the two inner (second and third) vehicles. As may be seen in the plan, the vestibule gangways between the two cars in each twin unit are on the same side. A centre vestibule connects cars Nos. 3 and 4. Spaces between all vehicles are covered by full-width rubber bellows to reduce air resistance.

As the three cars for passengers are air-conditioned, only a certain number of



Driving bogie of "ETR 250" electric train set

E



Traction motor with wheels and axle, and flexible transmission

level, the train starts with an acceleration of 0·37 metres (1·21 ft.) per sec. per sec.; on a gradient of 1 in 40 it can accelerate at 0·13 metres (0·43 ft.). per sec. per sec.

Auxiliary electrical services

Auxiliary electrical services are a.c. There are two motor alternator sets driven by 65-kW., 3,000-V. motors. Current at 220-V., 50 cycles a.c. feeds the Westinghouse 241 motor compressor sets, the F.S. type air-conditioning installations, the fluorescent lighting installation, the transformer rectifier equipment for battery charging, the all-electric kitchen, and the floor heating of the three vehicles conveying passengers. The air conditioning installations can give, for each passenger coach, a power of 30,000 frig./h., with expansion at 0° C., and condensation at 60° C. The control switches for the traction circuit are of the electro-pneumatic 420 type, both as line-breakers and for the combination of the motors and for the exclusion of the rheostat.

The design of the "ETR 250" sets is the result of collaboration between the Motive Power Research Department of the State Railways, and the Società Breda Ferroviaria and Breda Costruzioni Elettromeccaniche e Locomotive. The former devised the general layout of the interiors and wheel arrangement, bogies, the general design of the body structure, and electric traction and auxiliary equipment. The Technical Offices of the Società Breda Ferroviaria e Breda Costruzioni Elettromeccaniche e Locomotive worked out constructional details of the bodies and furnishings.

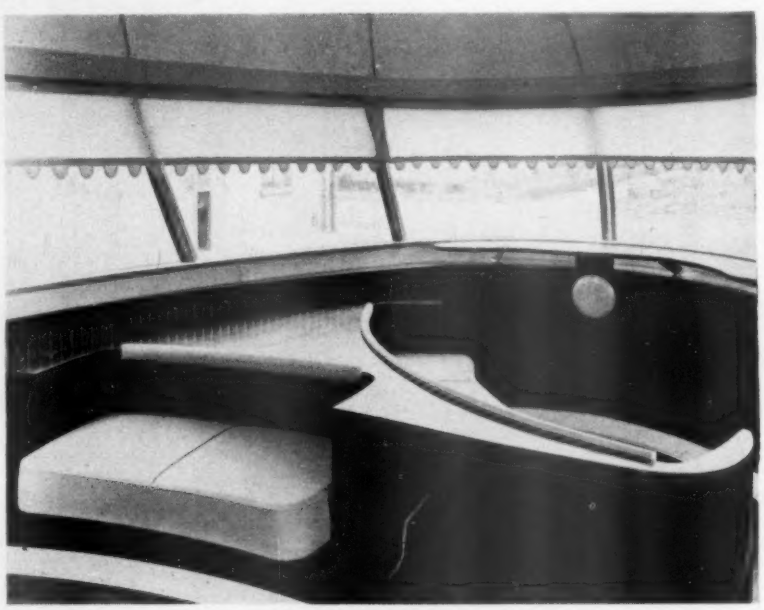
the windows are arranged for opening, which can be done by train staff in an emergency.

Telephone link

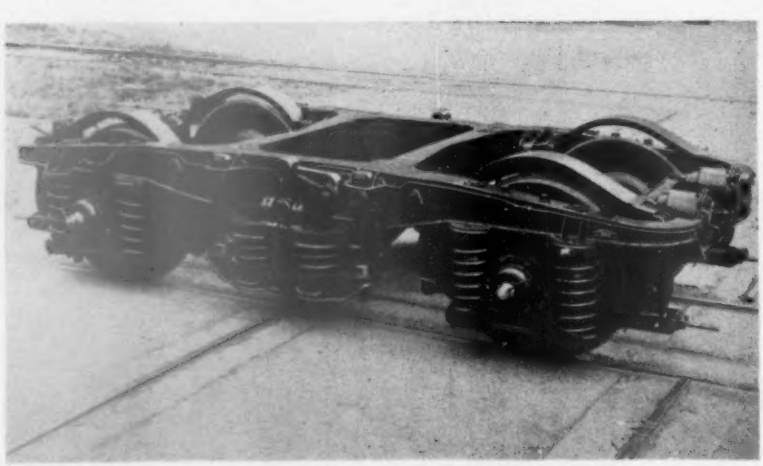
In car No. 3 the doors of the baggage compartment are operated pneumatically. The telephone and radio telephone installation provides a public address system, over which information, news, or music can be broadcast. The radio telephone enables a passenger to be connected with any public telephone system in the country.

Heat and sound insulation is stated to be by the normal Italian State Railways use of Limpet asbestos sprayed on the inside surface of the shell. The underside of the floor is insulated with the same material.

The total weight of the four-car set in running order is 181 tons, which gives a weight per passenger of 1·25 tons, compared with 2 tons per passenger in the "ETR 300" series. The total length over buffers is 97·25 m. (319 ft.). The maximum speed is 112 m.p.h.; on the



Observation lounge in the end of car No. 4



Trailing bogie of "ETR 250" electric train set

NEW SWISS ELECTRIC LOCOMOTIVES

Brief review of the Swiss Federal Railways electric locomotive programme for the current year

DURING 1961 there is to be considerable activity in Swiss electric locomotive building. One of the most interesting developments is a new Bo-Bo standard class, ultimately to number 50 units, of which six are to be built during the year at a cost of S.fr.9,000,000. At present the Swiss Federal Railways own 50 Bo-Bo units of the Re 4/4 type, rated at 2,480 to 2,520 h.p. at 51.5 m.p.h., which which hitherto have been responsible for most of the high-speed lightweight services, but because of the steepness of some of the gradients—as, for example, the 10 miles at 1 in 55 out of Lausanne in the Berne direction—trains of up to 12 74-ft. 6-in. lightweight coaches (which also have to be moved at 75 to 80 m.p.h. over the level sections) are a considerable tax on locomotives of such power. Recently the new RBe 4/4 motorcoaches, of 2,700 h.p., have taken over certain of these workings, most of which are now operated on the push-and-pull principle, but higher power is desirable.

High power/weight ratio

The new Bo-Bo type has been designed by Dr. F. Gerber, the Swiss Federal Railways Chief Officer of Traction & Workshops; the design is largely based on the Ae 4/4 type that began service in 1944 on the Bern-Lötschberg-Simplon Railway, on which at that time he held the same office. The B.L.S. Ae 4/4s were the first of their type in Switzerland (preceding the S.F.R. Re 4/4s by two years) and probably in the world, and their 4,000 h.p. and 79 tons weight gave them an unusually high power/weight ratio of 50½ h.p. per ton. The new S.F.R. Bo-Bo locomotives are to be of no less than 5,600 h.p. for the same locomotive weight, increasing the ratio to 71 h.p. per ton. Yet they are to be so compact that their length of 48 ft. 6 in. over buffers will be identical with that of the existing S.F.R. Re 4/4 type of less than half their h.p. As compared with 3-ft. 6-in. driving wheel diameter of the latter, the new locomotives are to have 4-ft. 1½-in. dia. wheels. Their maximum speed is 77½ m.p.h.

Passenger working

The new class is also intended eventually to take over the majority of the passenger workings on the Gotthard main line, where its high tractive effort will make possible rapid recovery from the many curve speed restrictions; it is hoped to be able to ease the latter by modifications in the bogie design and suspension. As a result of displacement from passenger service, the 50 Ae 6/6 Co-Co locomotives of 6,000 h.p., which before the end of 1963 will have been increased to 74 in number, will be able to take a greater share in freight working. On the Gotthard line, over which both passenger and freight traffic steadily increases, it is hoped to ease the line occupation problem by making the freight trains up to 1,200 tons, and working them by pairs of Ae 6/6 locomotives, which will be capable of climbing the long 1 in 38½-40 approaches to the Gotthard tunnel at speeds up to the limit of 46 m.p.h. with such loads.

For future road service, as distinct from shunting, the Swiss Federal Railways thus are concentrating on the Ae 6/6 Co-Co type, of 6,000 h.p.; the new Bo-Bo type of 5,600 h.p.; and the RBe 4/4 type motorcoaches, of 2,700 h.p., on which the number is to be increased. A wide range of use will still be found for the 50 Re 4/4 type Bo-Bo locomotives of 2,480 to 2,500 h.p.

Multi-current locomotives

A beginning is also being made with the equipment of locomotives for the use of current of different frequencies. Locomotive No. 10851, built originally as a gas-turbine-electric unit, has been rebuilt as an electric locomotive, Type Ae 4/6111, capable of using the Swiss standard 15,000-V. a.c. 16 2/3-cycles current and also the French 25,000-V. a.c. 50-cycles and 1,500-V. d.c. systems. It is stationed at Geneva for transfer work between the Swiss and French lines. The old 1Bo-Bo1 chassis has been retained, and thus the weight of 83 tons, of which 59 tons are available for adhesion, is on the high side for an h.p. of 2,300 only. Under construction at the present time also there are 10 C type six-wheel shunters which will similarly be able to operate on the three current systems mentioned and also on the Italian 3,000-V. d.c.; they are for service at the frontier stations of Chiasso, Geneva and Basle.

Nearing completion are the four Swiss Trans-Europe Express trains for the Paris-Milan and Zurich-Milan services, which are to begin operation with the 1961 summer timetable, and which also will be able to work with all the same four-current systems. Each will be a five-coach train of centre-corridor first class stock, and will comprise driving trailers at the outer ends, and a restaurant car in the centre, flanked by a passenger car on one side and a power car on the other.

The Bern-Lötschberg-Simplon Railway has had a marked success with its new electric locomotive No. 271, which comprises two Bo-Bo units permanently coupled with a total h.p. of 8,800, and a weight of 158 tons. A second locomotive of the same type is now under construction. The arduous assignment of No. 271 is that of making three return journeys daily between Berne or Thun and Brigue, involving six ascents in all to the 4,067 ft. altitude of the Lötschberg tunnel. In a daily mileage of 349 the locomotive thus conquers a total difference in level of 12,300 ft., and on five of its six runs with freight train loads up to 800 tons, which are worked up the ruling gradient of 1 in 37 at the full permitted speed of 46 m.p.h.

RAILWAY MODERNISATION

The following joint statement has been issued by the British Electrical & Allied Manufacturers' Association and the Locomotive & Allied Manufacturers' Association of Great Britain, commenting on the Government announcement on the railways in the House of Commons on January 30:—

"The railway equipment industry welcomes the green light on the London Midland electrification scheme and the Government's expression of confidence in the British manufacturing industry which will give impetus to the all-important export trade. The manufacturers and contractors fully support the British Transport Commission estimate that the scheme can be completed by 1966, and the technical, manufacturing, and constructional resources are available to achieve this target.

Industry disturbed

"The industry is, however, disturbed that despite several months' consideration the Government is still unable to give a clear indication of future policy regarding the modernisation programme as a whole. There is still no authorised capital investment beyond 1961, for which the authorised expenditure is already committed by existing orders.

Investment programme essential

"In order to use the resources of British industry to best advantage a long-term investment programme is essential. By its very nature railway equipment production has to be planned well ahead. The manufacturers therefore urge on the Government the necessity for giving early authorisation to the further modernisation proposals which are essential to secure the full benefits of improved services and increased traffic."

BARCELONA UNDERGROUND RAILWAY extension

Construction of the Sagrera-Horta line in tunnel built largely by the cut-and-cover method

By M. F. Planell, *Engineer to the Metropolitano Transversal de Barcelona*

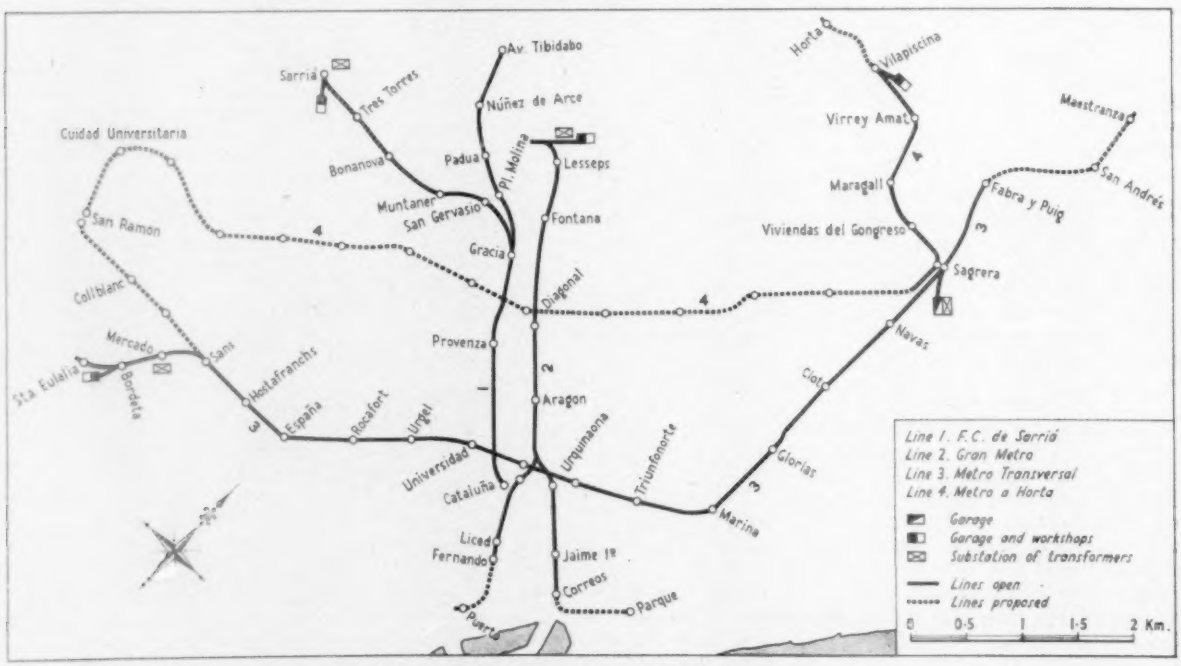
Sagrera Station, showing stairways between concourse and platforms

THE Sagrera-Saint Eulalic de Vilapiscina section of the new line serving the suburb of Horta was put into service on July 21, 1959. This line forms part of the Barcelona underground railway which is managed by the Barcelona Municipal Services. This line is numbered 4 in the accompanying illustration, in which the numbers against the lines indicate the order of their construction. The lines at present in operation are represented by full lines on the diagram and the projected extensions by dotted lines. It will be seen that line No. 4 will, in the future, play a similar role in the higher part of the town to that of line No. 3 in the lower part.

The section recently put into service is about 1¾ miles long and serves five stations. The topography of the districts served by the line is such as to require sustained gradients up to 4·2 in 100 and the Maragall and Virrey Amat Stations had to be built on curves.

Tunnel construction

The normal width of double track tunnels on tangent track is 23 ft. In some places they comprise two single track tunnels, as, for example, at the approaches to those stations having an island platform and where the tunnels are near to the surface under future construction sites. The tunnels and the vaults of the stations were built in mass concrete. The method of construction differed according to the depth and the nature of the subsoil. A typical example of cut-and-cover construction is that under the Calle de Garcilaso, where the street is only 39 ft. wide and the width over the tunnel abut-



Map of Barcelona Underground Railway system

ments 29 ft. 6 in. An existing sewer under the centre of the street had to be displaced to make room for the tunnel.

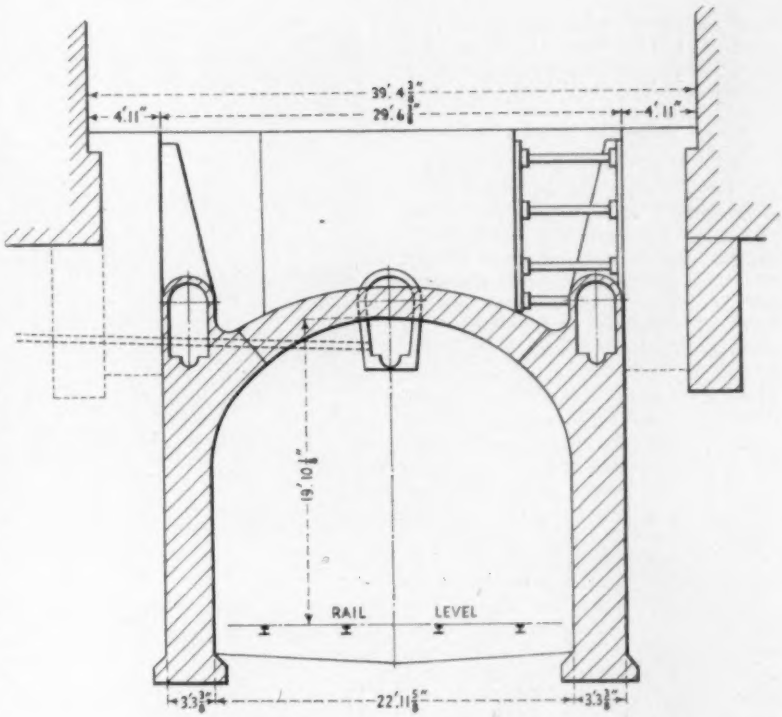
First, the foundations for the abutments were excavated, the earth being retained by timber shoring and the foundations of the houses strengthened where necessary. The concrete abutments were then poured to the springing of the arch and on top of each of them a sewer was constructed to replace the central sewer. On the new sewers, buttressed retaining walls were built in brickwork to replace the timber shoring. The earth was then excavated to the surface of the intrados of the arch, the existing sewer was demolished and the concrete arch poured on to a form of duly prepared earth.

Station construction

The arrangement and method of construction adopted for the stations varied according to circumstances, but for all of them, except Maragall, the arrangements used for the concourses, and the stairways to the platforms, were the same. Instead of constructing the concourses separately from the arched space housing the platforms with the stairways in sloping tunnels, the whole has been accommodated in one arched enclosure, unobstructed and well lighted. Refreshment bars, hairdressing saloons, bookstalls, and so on, are provided in the concourses.

The Sagrera Station, adjacent to another station on line 3, will handle a heavy passenger traffic when line 4 is extended. Three platforms have, therefore, been provided so as to avoid interference between alighting and entraining passengers. The construction of Maragall Station and the adjacent tunnels presented some difficulty over a length of about 550 yd., because of the sandy nature of the soil and the water table which is at the level of the springing of the arches. Because rail level is about 49 ft. below street level, escalators were installed. With a view to reducing the total volume of the work and to enable two escalators only, one at each end, to serve the station, a single island platform was built. The platform length at all stations is 98 yd.

Tunnel being constructed under the Calle de Garcilaso



Cross-section of tunnel under the Calle de Garcilaso

The permanent way comprises 45 kg. per m. flat bottom rails laid on timber sleepers. The joints are welded by the thermit process. The automatic colour-light signalling system is of the usual type using a.c. track circuits.

Traction current

Direct current for traction purposes is supplied at 1,200 V. by an unmanned sub-station operating from a 25,000-V. three-phase supply and housing two transformer-rectifier sets, one of which acts as a stand-by. Each has a continuous rating of 2,000 kW. The rectifiers are of the pumped, mercury-arc, fan-cooled type.

The supply to the trains is by an overhead catenary system. The contact wire is hard-drawn copper of 107 sq. mm. cross-section and is suspended from a copper catenary of 153 sq. mm. cross-section.

Rolling stock

Operation of the line commenced with two-car trains, both being motor coaches because of the heavy gradients and considerable peak hour loads. Moreover, as all the axles are driving, comparatively high accelerations can be achieved with less likelihood of wheel-slip.

The coach bodies are 16·5 m. long and 2·72 m. wide. The bogies are of welded-steel construction and each is equipped with two motors each having a continuous rating of 68 kW. (92 h.p.) at 1,265 r.p.m. (one-hr. rating 77·3 kW.=105 h.p. at 1,200 r.p.m.). The two motors of each bogie are permanently connected in series. Provision is made for operation with the two groups of motors in series (13 notches), in parallel (six notches) and in parallel with weak field. The drop-out value of the accelerating relay currents, and hence the mean accelerating tractive effort, can be set to two different values, the higher of which is selected, under heavy load conditions only, by the motorman by a push-button acting on all the relays.

Anti-slip device

Should the motorman operate the button under light-load conditions, with resultant wheel-slip, an automatic electro-pneumatically operated anti-slip device momentarily applies moderate brake pressure to the wheels, sufficient to arrest the slip.

Three braking systems are available, air, rheostatic (13 notches), and manual. Normally, the rheostatic brake (controlled by a braking relay) is used both to hold the train on gradients and to reduce its speed almost to zero at stopping points. In this way wear of the brake blocks, which are of wood, impregnated with olive oil, is reduced to a minimum.

So that the rheostatic braking effort shall be established surely and without delay, a degree of supplementary independent excitation is applied to the

motors and removed as soon as sufficient self-excitation has been established. If a pair of wheels should slip during braking, the anti-slip device intervenes.

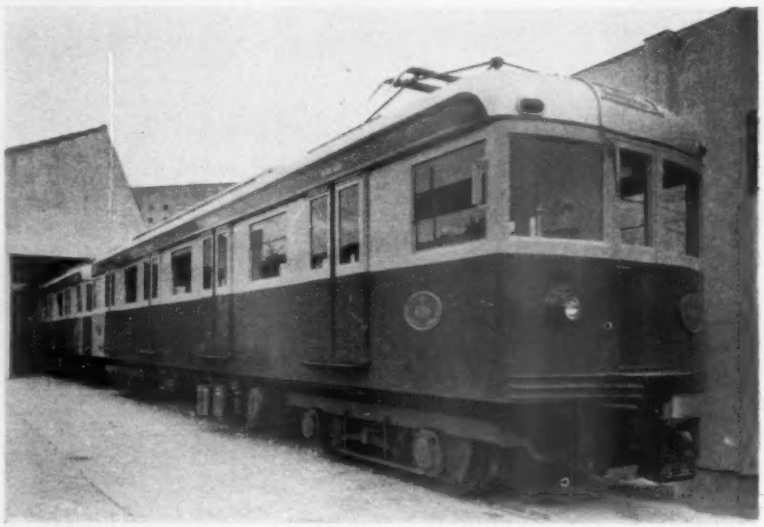
Rheostatic braking

For rheostatic braking the two pairs of motors are connected in parallel, with the field circuits cross-connected in the usual manner so that the current may be shared equally between the two pairs despite any small differences of speed and magnetic properties which may exist. In the event of wheel-slip, the difference in speed and electro-magnetic forces is very great. To limit the circulating current which overloads one pair of motors and reduces the load on the other, the fixed resistance normally inserted in the braking circuit is divided into two resistances of double the value, each of the resistances being in series with one of the pairs of motors.

If, when braking at high speed, the voltage generated by the motors should approach a value likely to be injurious to the commutators, a voltage relay arrests the braking switch group, and thereby the current increase, until the voltage has fallen to an acceptable value. In the meantime, the limitation of rheostatic braking is compensated for by the automatic application of the air brake.

Fault protection

Because short circuit current values may be considerable, circuit breakers of adequate rating would be too large to be mounted on the underframes. Protection against full faults is therefore provided by high rupturing capacity fuses, but faults arising from defective insulation to earth are quickly cleared by two contactors in series, which are tripped by a differential relay the coils of which compare the value of the current entering and leaving the motor circuit. With this arrangement the fuses are rarely called upon to operate.



Motor coach of multiple-unit train

METROPOLITAN LINE MODERNISATION

The first section of the new northbound and southbound tracks laid to quadruple the 6¼ miles of the London Transport Executive Metropolitan Line between Harrow North Junction and Watford South Junction was brought into use on February 5. The one-mile section concerned runs between Northwood Hills and Northwood, excluding the stations themselves. Temporary connections and signalling have been installed between the old and new tracks and all trains run over the new line. This has allowed the old tracks to be taken out of use temporarily so that work on the second spans of the new bridges over Chestnut Road and Ricksmansworth Road, Northwood, and the earthworks for raising the level of the original tracks, can be carried out free of rail traffic.

A further section of the new tracks, between Northwood and a point between Moor Park and Watford South Junction, is to come into use in the spring. This will coincide with the opening of the first of the two island platforms and the new booking hall at Moor Park station, allowing the old station to be demolished and the second new platform to be built. It will also enable the second half of the nearby Sandy Lodge Lane bridge to be rebuilt clear of the running rails.

At Northwood, the new high-level station ticket hall over the tracks has been brought into use with temporary booking facilities. The new southbound platform and canopy is under construction alongside the old station and the former southbound platform, dating from 1887, is being re-built with a face on the opposite side to become the new northbound platform.

This year will also see the completion of 14 of the 17 reconstructed or widened bridges for the new tracks and the delivery of some of the new aluminium trains.

Sagrera sub-station, showing rectifiers, d.c. switchgear cells, and control panels

LOCOMEN'S QUIZ COMPETITION

The semi-finals of the North Eastern Region's 1960-61 "Mutual Improvement" Quiz Competition for locomotivemen took place on Wednesday, February 1, in the York Railway Institute and Darlington North Road Institute.

Competing teams at York represented the motive power depots at West Auckland, Hull (Botanic Gardens), and Sunderland. Mr. R. W. Taylor, District Motive Power Superintendent, Leeds, was Questionmaster. The winning team was West Auckland.

At Darlington, teams represented the motive power depots at York, Low Moor (Bradford), and Holbeck (Leeds). Mr. A. R. Jefferson, District Motive Power Superintendent, Middlesbrough was Questionmaster. The winning team was Holbeck "A".

Each of the winning teams will go forward into the Regional final to be held at the York Railway Institute on Wednesday, February 22, 1961.

PERSONAL

Industrial

MR. DUNCAN BAILEY, O.B.E., M.I.MECH.E., who has resigned the Chairmanship of Charles Roberts & Co. Ltd., will retain his seat on the board of that company for the time being. Mr. Bailey, who was born in 1875, has served Charles Roberts & Co. Ltd. for 61 years. Since 1927, he has served as Chairman. He began his career in 1890 as a junior under the late MR. NICHOLAS RETALLACK in the Works Manager's Department of the Birmingham Railway Carriage & Wagon Co. Ltd. From 1892 to 1899 he served with the Gloucester Railway Carriage & Wagon

Co. Ltd., and was sent out by that company to Umtali with the first four railway carriages for the Mashonaland Railways. Returning to this country, he was appointed by Charles Roberts & Co. Ltd. as Assistant General Manager. He was made General Manager in 1911, Managing Director in 1916, and Chairman in 1927. He resigned as Joint Managing Director on December 31, 1948, but retained his position as Chairman. Mr. Bailey has held many offices in connection with the private wagon-building trade, and has served on various committees. He was President of the Wakefield Chamber of Commerce & Shipping from 1921 to 1927. For special work during the 1914-18 war he was made an O.B.E.

MR. NEVILLE SMITH, who is succeeding MR. W. F. BROOKS as Secretary of the British Electric Traction Co. Ltd., also will succeed Mr. Brooks as Secretary of the B.E.T. Federation Limited, when the latter takes up an executive appointment with B.E.T.'s associate Rediffusion Limited. MR. R. ST. C. SANDALL has been appointed Assistant Secretary of the B.E.T. Federation Limited, and Secretary of B.E.T. Omnibus Services Limited, in place of MR. D. A. SMITH, who succeeds Mr. Neville Smith as Secretary of Rediffusion Limited.

SIR JAMES JOINT has joined Association of British Chambers of Commerce as a Deputy Secretary.

MR. R. G. HOOKER has been appointed Deputy Managing Director of K. & L. Steelfounders & Engineers Limited.

MR. LESLIE RUMLEY, Sales Director of Conveyancer Fork Trucks Limited, Electro-Hydraulics Limited, and Conveyancer-Scott Electric Vehicles Limited, has been elected President of the British Industrial Truck Association for the year 1961.

MR. K. H. PLATT has been appointed to succeed MR. B. G. ROSSINS as Secretary of the Institution of Mechanical Engineers, from June 1.

MR. P. T. STEPHENS has been appointed Chairman of the board of Saunders Valve Co. Ltd. MR. A. L. TRUMP and Mr. P. T. Stephens will continue to act as Joint Managing Directors.

MR. WILLIAM THOMAS JAMES has resigned from the board of the British Electric Traction Co. Ltd. in view of his impending retirement. MR. PAUL ADORIAN has been appointed to fill the resulting vacancy.

MR. J. ATHERTON, Chief Engineer, Kendal & Gent Limited, has joined William Asquith Limited, a subsidiary company of Asquith Machine Tool Corporation Limited, as a director and Chief Engineer. MR. A. JOHNSON has relinquished his position as Chief Engineer of that company but has retained his seat on the board and will act as consultant.

MR. R. H. NEWTON has been appointed Works Director of Aberdare Cables Limited. MR. NORMAN CARE, General Manager of South Wales Switchgear Limited, has undertaken the additional duties of co-ordinating the sales organisation of home factories in the Aberdare Holdings group.

MR. W. A. GALBRAITH, General Sales Manager, British Materials Handling Division, Yale & Towne Manufacturing Company, has been appointed Sales Director of the British Materials Handling Division of that company.

MR. D. K. FRASER, Joint Managing Director, G. A. Harvey & Co. (London), Ltd., has been appointed Managing Director. MR. H. E. COOPER has relinquished his office of Joint Managing Director, but remains a director of the company.

MR. G. O. PRITCHARD relinquished the position of Manager, Traffic Department, Associated Electrical Industries (Rugby) Limited, on December 31, but will remain, for a time, in the service of the company in a consultative capacity. He is succeeded by MR. R. H. THORNICROFT.

MR. A. E. W. AUSTEN has been appointed as an executive director of C.A.V. Limited.

MR. N. R. R. BROOKE has been appointed a director of Guest, Keen & Nettlefolds Limited.

MR. RUSSELL BAILEY, O.B.E., M.I.MECH.E., who succeeds his father, Mr. Duncan Bailey, as Chairman of Charles Roberts & Co. Ltd., will combine that office with the Managing Directorship he has held since 1940, when he was appointed to hold that office jointly with his father. Born in 1901, he was educated at Bromsgrove School, and then served

his apprenticeship in the locomotive works at Doncaster. From there, he went to Clare College, Cambridge, for two years. He joined Charles Roberts & Co. Ltd. in 1922 as Assistant Works Manager, was appointed Assistant Managing Director in 1932, and Joint Managing Director in 1940.

A. G. Wild & Co. Ltd. has announced that MR. N. WELCH has been appointed Sales Manager of that company.

MR. D. D. TEASDALE, Secretary & Chief Accountant, Fawcett Preston & Co. Ltd., has been appointed General Manager and has joined the board of the company.

MR. A. BROOMHEAD has been appointed Deputy Managing Director of Thos. Firth & John Brown Limited and MR. F. WORTLEY, a Director of that company, has been appointed General Works Manager.

MR. DAR JOHNSON has been appointed Director of Personnel of the Hyster Company of Portland, Oregon, U.S.A.

MR. R. H. HAZLEHURST has been appointed Midlands Area Representative, Lumenated Ceilings Limited.

MR. P. R. ARMITAGE has been appointed Manager of the Traction Division of the General Electric Co. Ltd. in succession to MR. W. D. MORTON, whose promotion to the position of Assistant General Manager of the Witton Works occurred recently.

We regret to record the death of MR. J. D. COLDWELL, Chief Designer, Conveyancer Fork Trucks Limited.

MR. H. CHAPPELLE, Works Director, Beckett, Laycock & Watkinson Limited, has retired.

MR. H. J. ARBUTHNOTT has been elected to the board of the North British Locomotive Co. Ltd.

MR. A. W. PAGE has been appointed Sales Director of Brookhirst Igranic Limited, a member of the Metal Industries Group.

MR. M. A. GRIFFITH-JONES has been appointed General Sales Manager of Chloride Batteries Limited.

MR. A. J. R. WALTER has resigned from the board of the Permutit Co. Ltd., but will be available in a consultative capacity.

MR. JOHN MCWHINNIE ARMSTRONG, Assistant Secretary, has been appointed Secretary of Dorman Long & Co. Ltd., as from February 2, in succession to MR. R. S. H. CAPES, who has retired.

MR. G. E. SAVORY has been appointed Assistant Managing Director of Ruston-Bucyrus Limited, and MR. F. WILDMORE has been appointed to the board of that company as Director & Commercial Manager.

MR. A. G. CLEGHORN, General Works Manager, Blackheath, and MR. W. H. WENTWORTH PING, General Sales Manager, Sheffield, have been appointed Special Directors of Firth-Vickers Stainless Steels Limited.

SIR JOSEPH LATHAM, who retired as Deputy Chairman of the National Coal Board last year, has been appointed a director of Associated Electrical Industries Limited. Sir Joseph is a director of George Wimpey & Co. Ltd.

MR. J. Y. MCDONALD has been appointed Manager, Diesel Engines, Preston Works, English Electric Co. Ltd. He replaces MR. J. H. A. SHARPLEY, who is undertaking other duties. Mr. McDonald, who has been Assistant Manager of Engineering, Preston, will be responsible to the General Manager, Preston.

MR. N. M. HADFIELD, Chairman & Managing Director of Hadfields (Merton) Limited, has relinquished this position. MR. P. MCC. HADFIELD and MR. B. A. SHATTOCK have been appointed Joint Managing Directors with effect from January 1.

The General Electric Co. Ltd. has announced that MR. T. B. O. KERR, Secretary of the company, has been appointed Deputy Managing Director, and MR. E. H. DAVISON has been appointed Financial Director. A management committee has been formed, the members of which are: MR. ARNOLD LINDLEY (Chairman of the Company), MR. T. B. O. KERR, MR. E. H. DAVISON, MR. O. W. HUMPHREYS and MR. R. N. MILLAR.

MR. RICHARD ADAMS has been appointed General Manager of the newly-created Engineering Division of Castrol Limited.

MR. T. K. SINGER has been appointed General Sales Manager of James Booth Aluminium Limited.

MR. F. A. B. ANDREWS, Manager, London Office, W. H. Allen, Sons & Co. Ltd., has retired. He is succeeded by MR. E. O. CHARLTON.

MR. F. J. NEWMAN has retired from Pritchett & Gold & E.P.S. Co. Ltd. after 40 years of service.

MR. S. H. GOSS has been appointed Joint Managing Director of Firth Cleveland Instruments Limited, with MR. L. G. OXFORD.

MR. T. E. H. BIRLEY, Deputy Overseas Manager, British Insulated Callender's Cables Limited, has retired after 40 years' service with the company.

MR. W. L. WATSON, Works Manager, Northampton Works, Pollard Bearings Limited, has now been appointed Works Manager, Ferrybridge Works.

MR. D. H. F. JOYCE, Manager, Supplies & Transportation Department, Shell Mex & B.P. Limited, has been appointed Manager, Supplies & Distribution Department.

VICE-ADMIRAL SIR NORMAN DALTON has been appointed Technical Consultant to J. Stone & Co. (Holdings) Ltd., and has joined the board of Epsylon Industries Limited.

MR. HARRY RICHARDS, Chairman of Wolf Electric Tools Limited, has retired after 53 years of service. He is retaining his seat on the board of Wolf Electric Tools (Holdings) Limited.

Having reached normal retirement age, MR. A. E. REDDELL has retired from the board of Vickers-Armstrongs (Engineers) Limited, and from his office of Director-in-Charge of the Weymouth works of that company, with effect from January 31, 1961.

MR. N. A. MORLING, a member of the board of Turner & Newall Limited, and the present Chairman of Turner Brothers Asbestos Co. Ltd., J. W. Roberts Limited, and Glass Fabrics Limited, is retiring from the boards of those companies. He will be succeeded by MR. G. S. SUTCLIFFE.

MR. H. MARTIN, Home Sales Manager, Murex Welding Processes Limited, has retired. He is succeeded by MR. R. E. H. BELL, Assistant Home Sales Manager. The same firm also announce the following appointments: MR. K. LEEVERS and MR. P. HOBBS, to be Assistant Home Sales Managers (Technical), and MR. S. E. SMITH to be Plant Sales Manager.

MR. B. N. JOLLY has been appointed Managing Director of E. Boydell & Co. Ltd., Manchester, to succeed the founder of the company, Mr. E. Boydell, who will remain as Chairman. Following the acquisition of the equity of the company, by Winget Limited, MR. R. DUCAS, Chairman of Winget and MR. E. F. O. GASCOIGNE, Deputy Chairman, are also joining the Boydell board.

MR. CHARLES F. DICKSON, who has been a Director of Crompton Parkinson Limited since 1939, has been appointed a Vice-Chairman of the company.

MR. HECTOR V. SLADE, managing director of the Garrard Engineering & Manufacturing Co. Ltd., has joined the board of Plessey Co. (International) Ltd.

MR. E. F. DUNCAN has been appointed Manager of the Accessories Division, British Insulated Callender's Cables Limited, Prescot, with effect from January 1.

MR. B. R. D. CLARKE has been appointed Administration Officer of the Technical Division of the British Oxygen Co. Ltd. He is succeeded as Secretary by MR. E. F. BURGESS.

MR. A. POTTER has been appointed General Sales Manager of Lansing Bagnall Limited, MR. E. H. WHEELER has been appointed Export Sales Manager, and MR. CHARLES ARTHUR BARR has been appointed Manager of the Technical Services Division of the company.

MR. S. E. CLOTWORTHY, Managing Director of Alcan Industries Limited, has been elected Chairman of the Aluminium Industry Council in succession to MR. H. G. HERRINGTON, Managing Director, High Duty Alloys Limited.

Shell-Mex & B.P. Limited has announced the following appointments: MR. A. C. DURIE to be General Manager, Industrial Sales; MR. E. RENDALL to be Assistant General Manager, Industrial Sales.

MR. T. JELLY and MR. C. R. WHEELER have resigned from the board of Guest, Keen & Nettlefolds (South Wales) Limited. MR. L. R. P. PUGH and MR. H. W. A. WARING have been appointed Directors in their place.

MR. JAMES RITCHIE has been appointed Financial Director of Holman Brothers Limited. Two Associate Directors, MR. J. L. RITCHIE (Sales Director) and MR. J. M. WILLIAMS (London Director), also become Directors.

MR. E. E. CAFFYN, of the Power Rectifier Sales Department, A.E.I. Heavy Plant Division, Rugby, retired on January 31 after more than 48 years of service. Among others, he handled the contracts for the rectifier sub-station equipment for the Cockfosters extension to the London (Piccadilly) Electric Railway and those for the Western extension to the Central London Railway.

MR. F. G. HATHAWAY, Senior Signal Engineer, Westinghouse Brake & Signal Co. Ltd. is to be recommended, by the Council of the Institution of Railway Signal Engineers, for election as President for 1961, with MR. J. S. S. DAVIS, Assistant Signal & Telecommunications Engineer, British Railways, London Midland Region, as Vice-President.

British Insulated Callender's Cables Limited has announced the following changes in the overseas organisation of the company in London: MR. C. MURRAY is designated

General Overseas Manager, responsible for the operation of the overseas organisation and the co-ordination of its activities overseas; MR. C. A. CHILDWICK becomes Overseas Manager, responsible for all B.I.C.C. activities in Africa, the Middle East, and the Near East and will deputise for Mr. Murray in his absence; MR. G. C. KNIGHT becomes Overseas Manager, responsible for all B.I.C.C. activities in Australia & New Zealand, Canada & the United States, Central America, West Indies & South America, and Spain, Portugal & Gibraltar; MR. A. F. COVENTRY becomes Overseas Manager, responsible for activities in Europe (excluding Spain, Portugal & Gibraltar), India, Pakistan and Ceylon; MR. J. L. WOOLLETT becomes Regional Manager for Canada & U.S.A. responsible to Mr. Knight; MR. W. F. NORTH, while continuing as Secretary, Telegraph Construction & Maintenance Co. Ltd. (Telcon), and Selborne Plantation Co. Ltd., and as General Manager of Telcon Enterprises Limited, becomes Personal Assistant to Mr. Murray.

MR. L. GOSLAND has been appointed Deputy Director of the British Electrical & Allied Industries Research Association. He will continue to hold the position of Research Manager. MR. C. G. GARTON and MR. E. W. GOLDING have been appointed Assistant Directors. Mr. Garton will continue to be Head of the Materials Department, and Mr. Golding will remain Head of the Rural Electrification Department and Overseas Liaison Officer. DR. R. H. GOLDE has been appointed Head of the Surges & Transformer Department. MR. M. WATERS has been appointed Deputy Head of the Department.

British Transport Commission

The British Transport Commission announces the following appointments:—

Manpower Department

MR. R. J. L. PERFITT, Assistant Docks Manager, Newport Docks Division, appointed Assistant Director of Studies, British Transport Staff College, Woking.

MR. H. SAMUEL, Senior Instructor (Operating), appointed Assistant Principal British Railways School of Transport, Derby.

Shipping & International Services Department

MR. E. A. TONERI, Assistant, Research Department, appointed International Liaison Assistant.

Architect's Department

MR. A. B. KAUKAS, Senior Assistant Architect, appointed Principal Assistant Architect.

MR. N. D. T. WIKELEY, Senior Assistant Architect, appointed Sectional Architect.

British Railways

MR. A. AYTON has been appointed Stationmaster, Selby, North Eastern Region, British Railways.

MR. H. ROWLEY, Assistant Works Manager (Locomotive), Doncaster, British Railways, Eastern Region, has been appointed Assistant Locomotive & Rolling Stock Engineer, Doncaster.

MR. F. W. G. SMITH has been appointed Divisional Signal & Telecommunications Engineer at Crewe, London Midland Region, British Railways.

MR. J. W. GALBRAITH has been appointed District Operating Superintendent, Edinburgh, Scottish Region, British Railways.

MR. B. R. FLACH, Assistant, Chief Civil Engineer's Department, Kings Cross, British Railways, Eastern Region, has been elected an Associate Member of the Institution of Civil Engineers.

Central Transport Consultative Committee

The following persons have been appointed members of the new Central Transport Consultative Committee, which will sit until December 31, 1963.

Chairman

SIR RONALD GARRETT

Members

(Representing agriculture)

MR. J. L. BRIGHTON

MR. D. GOODFELLOW

(Representing commerce and industry)

MR. E. G. WHITAKER

MR. D. H. JOYCE

MR. S. C. ROWELL

*MR. F. J. S. HALL

*MR. F. WILKINSON

(Representing shipping)

MR. H. LESLIE BOWES

(Representing labour)

MR. H. COLLINSON

*MR. J. O'HAGAN

(Representing local authorities)

MAJOR-GENERAL P. G. WHITEFOORD

MAJOR SIR CHARLES PYM

*ALDERMAN S. I. DYSON

*COUNCILLOR W. SPENCER

*MR. A. SMITH

(Representing the British Transport Commission)

MR. K. W. C. GRAND

MR. M. A. CAMERON

*Indicates new member

The office of the Committee is at 22, Palace Chambers, Bridge Street, London, S.W.1. The Secretary is Mr. J. C. Chambers.

The Chairman of the Transport Users' Consultative Committee for Scotland (SIR JOHN BANKS) and of the Committee for Wales & Monmouthshire (to be appointed in place of the late MR. R. G. M. STREET) are also members of the Central Committee by virtue of their chairmanship of these committees.

Overseas

MR. D. H. C. DU PLESSIS, General Manager, South African Railways, will retire on March 11. His successor has not yet been named.

Canadian National Railways has announced the following appointments: MR. D. M. TROTTER is to be Assistant to Vice-President, Transportation & Maintenance; MR. L. S. MCGREGOR to be Chief of Motive Power & Car Equipment, and MR. R. A. GORDON to be General Manager, Express Department.

MR. MALCOLM ARCHER, Public Relations Officer, East African Railways & Harbours, has been appointed Kenya Government Public Relations Officer in London. He succeeds MR. GRANVILLE ROBERTS, who becomes the Kenya Agent in London. Mr. Archer is due to travel to London by air on March 19 to take up his new duties.

Institution of Railway Signal Engineers

The following names have been entered on, or transferred in, the register of the Institution of Railway Signal Engineers :—

Associate Members

MR. J. E. ATKINSON, Section Engineer, Westinghouse Brake & Signal Co. Ltd.

MR. D. G. CLARKE, Engineering Assistant, S.G.E. Signals Limited.

MR. F. A. COULTATE, Engineering Assistant, Chief Signal & Telecommunications Engineer's Department, York, British Railways, North Eastern Region.

MR. A. R. DRABWELL, Engineering Assistant, Chief Signal & Telecommunications Engineer's Department, York, British Railways, North Eastern Region.

Associate

MR. H. W. W. LEWMAN, Executive Assistant, London Transport Executive.

Institution of Locomotive Engineers

The following names have been entered on, or transferred in, the register of the Institution of Locomotive Engineers :—

Members

MR. E. BRYAN, Director of Technical Development, Tulloch Limited, New South Wales, Australia.

MR. H. J. ARBUTHNOTT, General Manager (Production), North British Locomotive Co. Ltd., Glasgow.

Associate Members

MR. C. A. HUGHES, British Transport Commissioner, Locomotive Performance & Efficiency Unit, Nelson Street, Derby.

MR. R. A. NOEL, Assistant Engineer (Electrical), Rhodesia Railways.

MR. G. H. PATERSON, Mechanical Department, Umtali, Rhodesia Railways.

MR. V. S. V. RAGHAVAN, Assistant Traction Engineer, English Electric Co. Ltd., India.

MR. G. E. SANDS, Locomotive Shedmaster, Motive Power Department, Stoke-on-Trent, British Railways, London Midland Region.

MR. J. L. TAYLOR, Senior Machine Designer, Electric Traction Machines, English Electric Co. Ltd., Bradford.

MR. R. H. THOMAS, Technical Assistant, Chief Mechanical Engineer's Department, B.T.C.

MR. P. C. SEN, Divisional Mechanical Engineer, Sealdah, Eastern Railway, India,

Graduates

MR. B. B. BONIFACE, Technical Assistant, Chief Mechanical & Electrical Engineer's Department, Liverpool, British Railways, London, Midland Region.

MR. C. J. SMITH, Draughtsman, Chief Mechanical Engineer's Department, Bulawayo, Rhodesia Railways.

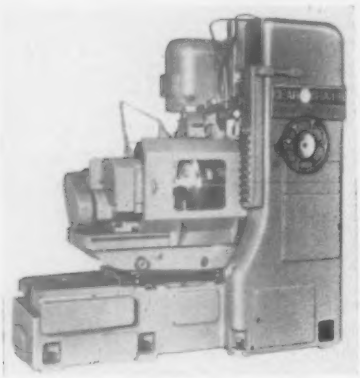
MR. J. P. A. TULEY, Graduate Apprentice, Dick Kerr Works, English Electric Co. Ltd.

MR. D. F. FAWCETT, Draughtsman, Chief Mechanical & Electrical Engineer's Department, York, British Railways, North Eastern Region.

Erratum

We regret that, in our issue of January 27, we credited MR. W. F. BEATTY, newly-appointed Assistant Civil Engineer, London Midland Region, British Railways, as an F.R.I.B.A. Mr. Beatty does not hold this qualification.

NEW EQUIPMENT *and Processes*



GEAR SHAVING MACHINE

The range of Red Ring gear shaving machines has been increased by the addition of the type GCX-24 in. machine, as illustrated above. It is suitable for processing gears required for heavy automative vehicles. It is of the tunnel design, and possesses all the advantages of the column-type shaving machine without restricting the method of vertical loading and unloading.

The main features of the design consist of a 72-in. robust reciprocating table, and a heavy cast column which straddles the table. The table carries a power-driven headstock, and an adjustable tailstock. The column houses the cutter head, vertical feed, and transverse assembly, and the control panels.

The gear shaving cycle includes running the work gear and cutter in tight mesh while reciprocating the work across the face of the cutter. The cutter automatically feeds one increment into the work, and the work gear rotation reverses at the end of each table stroke. After a selected number of such strokes (feed and idling) the cutter rises rapidly to clear the work, and the table is quickly traversed back to the loading position. As the cutter is driven by the work gear, which is the heavier of the two, no dangerous stress is imposed on the cutter teeth by rapid changes in rotation with each table stroke.

The machine can handle work having a pitch dia. range from 3 in. to 24 in., a maximum outside dia. of 25½ in., a diametral pitch range from 2 to 16, and a maximum length between centres of 36½ in. The cutter pitch dia. is 12 in. The table stroke is 4 in. each side of centre with crowning, and 5 in. without crowning. The centre distance, cutter to work, ranges from 5 in. to 19½ in.

Further details may be obtained from Precision Gear Machines & Tools Limited, Bodmin Road, Coventry.

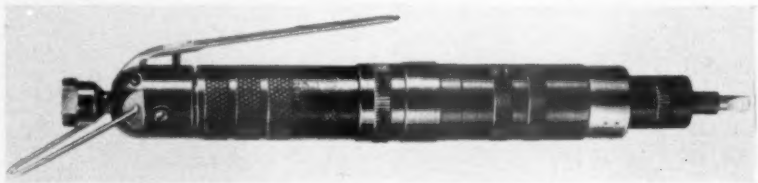
TORQUE-CONTROLLED
Screwdriver

The CP3008-LMS-1600 torque-controlled screwdriver and nutrunner incorporating a "magnamatic" clutch has been introduced by the Consolidated Pneumatic Tool Co. Ltd. (shown below) is designed to eliminate damage such as stripped threads and distorted workpieces caused by application of excessive torque during tightening of screws and nuts.

The screwdriver incorporates a new magnetic clutch consisting of a magnet housed inside a pair of mating, cylindrical jaws. At one end, the jaw cylinder is tapped to accommodate the threaded shank of the cylindrical magnet which fits inside the jaws, while a steel disc is located at the other end of the cylinder. The jaw teeth are curved-tooth shaped, the depth to which these interlock being governed by the number of turns made in the magnet shank. In operation, the torque required to separate the two jaws depends on the depth of engagement. When the required torque value is reached, the jaws disengage, the lower jaw being held out of engagement by a latch, which is released when the tool is withdrawn from the work.

The tool is equipped with a lever handle and has a nominal screw-size range from No. 4 to No. 8. The range of torque adjustment is from 5 to 20 in./lb. on soft pull-up work, while on free-running, sudden-stop work the maximum torque value is 40 in./lb.

Further details may be obtained from, Consolidated Pneumatic Tool Co. Ltd. 232, Dawes Road, London, S.W.6.



PORTABLE HARDNESS TESTER

A portable hardness tester, the only portable instrument of its type, is available to cover all recognised hardness value scales—V.P.N., Brinell, and Rockwell "C." It covers full B.S.I. 869 specification range of hardness values. Its weight is only 3 lb.

Further details of the tester, which was invented and developed by J. O. Deakin & Co. Ltd., can be obtained from the sole U.K. distributors, Smiths Industrial Division, Chronos Works, North Circular Road, London, N.W.2.

COMBINED HARD HAT
and Welding Shield

The Pulsafe combined hard hat and welding shield (left) is designed for use on welding operations carried out on site, where the hazards of flying particles, chippings, and dropped tools are greater than those normally encountered in workshops.

The welding shield is attached to the hat by a patented, recessed, sliding plastic block, locked in place by a spring-loaded automatic catch. The shield can be easily removed from the hat by manually operating the catch and sliding the shield clear.

The shield can also be swivelled up and over the hat to allow inspection of the work. It is held in any position by a rachet mechanism.

The hat is made of moulded plastic with an adjustable head harness and chin strap. The shield is available in either moulded vulcanised fibre or fibre glass, and is fitted with a hinged front panel, enabling the operator to chip or weld without raising the shield.

Further details may be obtained from Safety Products Limited, Holmethorpe Avenue, Redhill, Surrey.

Automatic level crossing barrier

First installation on British Railways of electrically operated train controlled barriers

The first automatically operated level crossing barriers to be installed on British Railways went into operation at Spath level crossing on February 6. This crossing of the B5030 road is on the double-track Churnet valley line between Uttoxeter and Rocester. The barriers, which are electrically operated by an approaching train, consist of a single pole fixed on each side of the crossing. The poles, illuminated and marked with red and white bands, cover the left-hand side only of the road, thus leaving the offside clear for traffic to escape should a vehicle have failed to clear the crossing by the time the barriers fall.

On the mounting post of each barrier is fitted two pairs of road traffic signals, one pair facing approaching traffic and one pair facing over the crossing. Also fitted is a loud-sounding two-tone gong.

Operating procedure

On a train approaching the crossing the road traffic signals begin to flash, each light of a pair flashing alternately, and the gongs ring. After a delay of 8 sec. the barriers commence to fall, completing their movements from the vertical to the horizontal position in 8 sec. When both barriers reach the lowered position the gongs are switched off. The fastest train is timed to arrive not less than 5 sec. after the barriers have been lowered, thereby giving a total time from the first warning to the arrival of the fastest train of 21 sec. Should a second train, on the other road, enter the control section before the first train has cleared and the barriers lifted, an indicator showing " Second train coming " is illuminated and the barriers held down until both trains are clear. When the sections are clear the barriers rise and the flashing road traffic signals and the arm lights are extinguished.

Track circuit control

The control section on each road comprises two track circuits and a treadle adjacent to the crossing. A short track circuit on the outside is used to hold the barriers down, and the inner circuit is used to control the barriers, lights, and gongs. The treadle is used as an additional safeguard at the trailing end of the controlling track circuit, interlocks preventing the barriers being raised until the treadle has been depressed.

The barrier arm is of light timber construction, covered on both sides with alternate plates of red and white reflecting material, and fitted with two red lamps which are illuminated when the arm leaves the vertical position. The arm is lifted by a 24-V. d.c. series-wound geared motor, arranged to provide rheostatic braking when the arm falls by gravity to the horizontal position. In the vertical position the arm is retained by an electro-magnetic lock, operating through a toggle linkage. Driven from the mainshaft is a nine-way circuit controller for switching of the various circuits. Each traffic signal, fitted with 24-V. 60-W. lamps, has a nominal flashing rate of 60 flashes per lamp per min. The word " Stop " is moulded into the lens. Current for the operating motors and lamps is supplied by a float-charged nife battery, of sufficient capacity to operate the installation for 12 hrs. in the event of a mains power supply failure.

In the event of a power, equipment, or track circuit failure, the barriers are lowered and one traffic signal of each pair illuminated by a steady light. The position of the barriers are indicated to the nearest open signalbox and an alarm rings in the signalbox if the barriers remain down for an undue length of time. Adjacent to the barrier is a two-way telephone to enable road users to contact the signalbox if there is an undue delay. Standard double white lines extend over the crossing, and on the approach roads, and the advance road warning signs as for a gated crossing are provided.

The whole installation, supplied by the Westinghouse Brake & Signal Co. Ltd., has been carried out to the requirements of the Minister of Transport and Mr. S. H. Gould, Operating Officer, London Midland Region, under the direction of Mr. S. G. Brentnall, Chief Signal & Telecommunications Engineer, London Midland Region.

Permanent Way Institution Conversazione

The ninth annual conversazione of the Permanent Way Institution was held at the British Transport Commission headquarters, 222, Marylebone Road, London, N.W.1, on January 28. The principal guest was Major-General G. N. Russell, Member of the British Transport Commission and Chairman of the Eastern Area Board. Other guests included:

B.T.C. and British Railways: Messrs. R. C. Bond, H. L. Brazier, A. R. Dunbar, C. P. Hopkins, H. C. Johnson, H. A. Short.

Brigadier C. A. Langley and Colonel D. McMullen, Ministry of Transport; Messrs. Alias and Tredé, French National Railways; and Mr. J. L. Hoorweg, Netherlands Railways.

Mr. A. K. Terris, President of the Institution and Chief Civil Engineer, Eastern Region, British Railways, welcomed the guests.

Major-General Russell referred to his railway training, as an officer of the Royal Engineers, on the Great Western Railway, to his service at the R.E. Railway Training Centre at Longmoor, and to the achievements of railway units of the R.E., largely composed of staff of British railways, during the war of 1939-45.

The task of British Railways and L.T.E. permanent way staff, he stated, had been aggravated in 1960 by the bad weather, resulting in slips and floods, but these emergencies and other major tasks had been dealt with efficiently—accomplishments which one took for granted.

Frustration and despondency had been caused last year, he added, by the " remarkable action of the Government in turning on and off the output of financial support with the greatest alacrity and irregularity." It was hard in those circumstances to plan with certainty. There might be some basis on which to plan work so that railway officers could arrange services against the known programme.

As to the future, he did not think that impending changes would apply to permanent way staff. The future in Britain lay, in a large measure, in railway transport, and as the future unfolded they would realise, more than they did at that moment, the railways' important part in Britain's commerce. He agreed that there should be more motorways; but if the railways had their house in order and their plans and organisation properly assessed, there was a future for them second to none.

Railway engineering staff must press on with their job. They would see the fruits and would be just as proud of it in the future as in the past. Only " a few old fellows like myself " might have to worry about their future.

Mr. A. H. Cantrell, Chief Civil Engineer, Southern Region, thanked Major-General Russell on behalf of the Institution.

Crompton Parkinson Limited in 1960

In 1960, Crompton Parkinson Limited again had a busy year. Deliveries of generators, traction motors and other equipment continued for the £10,000,000 British Transport Commission contract, this equipment being for use in 2,500-h.p. diesel-electric locomotives, several of which came into service during the latter part of the year. A large number of 1,550-h.p. Southern Region Type '3' diesel electric locomotives incorporating Crompton Parkinson equipment have also started service. This represents the first application in Great Britain of locomotives incorporating special generators for electric train heating. Further similar contracts are in progress, the total of these Type '3' equipments now built or on order being 98.

Stud welding

Stud welding occupies a prominent place in the company's activities and its applications have been extended to meet the ever-widening demands of industry for this process. In one instance alone, the civil engineering field, the development of stud-welded shear connectors on composite steel and concrete construction has again been remarkable and there is every indication that this application will be extended in many new directions. Further developments are in hand to cater for the specific needs of this section of the stud-welding market. A new technique has been devised for stud-welding to aluminium alloys which will have the effect of minimising porosity and atmospheric contamination.

The company has again figured prominently in the development of local manufacture in major overseas territories, notably in Australia, where the factories at Campbelltown and Sydney have been fully extended in the production of electrical plant and equipment, and in India, where a greatly increased output has been achieved by the

concentration of static plant production at Kanjur and of rotating plant production at Worli. The main emphasis of the company's overseas activities during the year has been once again on developing new markets. Special efforts have been made to sell the company's industrial a.c. motors and instruments in the United States and to develop the sale of fractional horsepower motors in Scandinavia.

Questions in Parliament

Railway workshops

Mr. Ernest Popplewell (Newcastle upon Tyne W.—Lab.) asked the Minister on February 1 if the proposed new Railway Boards will have power to produce their own motive power units or rolling-stock.

Mr. Ernest Fernyhough (Jarrow—Lab.) asked a similar question covering also other equipment.

Mr. Ernest Marples, answering both questions together, said that the White Paper stated the railway workshops would be vested in the railways board. He contemplated that forthcoming legislation would give this Board the statutory power members had in mind.

Mr. Gerald Nabarro (Kidderminster—C.) asked whether the Minister would bear in mind the extensive export trade carried on by the builders of the units in all parts of the world. If the railways were to have a monopoly of building power units for the British railway system, it would negative any possibility of extending our world-wide export trade in this very important equipment.

Mr. Marples said he was certain the export field should always be borne in mind in this respect.

Mr. C. Manuel (Ayrshire W.—Lab.) asked whether the Minister had just given a pledge that the existing railway workshops were to be kept in being under the Board.

Mr. Marples said the White Paper made it clear that the railway workshops would be vested in the Board and that the responsibility lay with the central Railways Board. The Board must decide how the workshops would be used.

Powers of new Railways Board

Mr. Francis Noel-Baker (Swindon—Lab.) asked the Minister on February 1 in what way the British Railways Board would differ from the former railway executive abolished in 1953; how he proposed to ensure close co-operation between that Board and the other nationalised transport undertakings, and what control it was proposed to give to Parliament over their work.

In a written answer Mr. Marples stated that the proposed British Railways Board, unlike the former Railways Executive, would be an independent statutory Board vested with its own assets and responsible for its capital debt and with its own statutory duties and powers. There were to be regional boards, each with a representative on the Railways Board. Co-ordination between the British Railways Board and the other nationalised transport undertakings would be on the lines indicated in paragraphs 20 and 27-30 of the White Paper. Broadly, the British Railways Board would be accountable to Parliament on lines similar to other nationalised industries at present.

Mr. A. Albu (Edmonton—Lab.) asked the Minister on February 1 what reply he had made to representations from the Middlesex County Council urging him to appoint a committee of inquiry into London Transport.

Mr. Marples said that the Middlesex County Council had been told that their representations were being considered. He already had under consideration a similar request from other quarters.

Railway research at Derby

Mr. Austen Albu (Edmonton—Lab.) asked the Minister on February 1 whether he had approved the capital expenditure proposed by the British Transport Commission for its new research laboratories at Derby.

In a written answer, Mr. Marples said he had not. By agreement between the Chairman of the British Transport Commission, discussions were proceeding between the Commission, the Department of Scientific and Industrial Research and the Ministry about this proposal and its relation to other research activities.

Early morning fares

Mr. L. Spriggs (St. Helens—Lab.) asked the Minister on February 1 if he would give a general direction to the British Transport Commission to retain cheap early morning fares on all forms of public transport for which they were responsible where such fares existed, and if he would similarly instruct his traffic commissioners to refuse applications they had received to raise early morning fares on public service vehicles.

Mr. Marples : No, Sir.

West Indians on railways and buses

Mr. N. A. Pannell (Kirkdale, Liverpool) asked the Minister on February 1 to what extent it remained the policy of the British Transport Commission to recruit personnel in the West Indies.

Mr. Marples said that recruitment was a function of management; he did not wish to interfere with the Commission's discretion. The Commission was short of manpower in certain grades and localities. A large-scale recruiting drive had not met with sufficient response, and the Commission was making up the deficiency by recruitment elsewhere.

Railway station at Stoke-on-Trent

Dr. Barnett Stross (Stoke-on-Trent Central—Lab.) asked the Minister of Transport on February 1 whether the station of Stoke-on-Trent had been included in the capital sum allocated for the improvement and extension of railway stations.

Mr. Marples said the Commission had put no proposals for major works at Stoke-on-Trent Station, but he understood they proposed to undertake certain minor works there in the course of the electrification work on the London-Midland main line.

Airdrie-Bathgate line

Mr. James Dempsey (Coatbridge and Airdrie—Lab.) asked the Minister on February 1 if, in view of the erection of the British Motor Corporation factory at Bathgate with its employment prospects for North Lanarkshire, he would authorise capital expenditure for the extension of the electrification of the railway from Airdrie to Bathgate.

Mr. Marples said the British Transport Commission had made no proposal for such an extension of the Glasgow suburban electric services.

Customs inspection on trains not feasible

Mr. Anthony Greenwood (Rossendale—Lab.) asked the Chancellor of the Exchequer on February 2 what plans he had for Customs inspections to take place on trains and coaches from ports and airports with a view to facilitating the arrival of travellers from abroad.

Mr. Anthony Barber, Economic Secretary to the Treasury, in a written answer stated that Customs examination on trains and coaches would be inconvenient for travellers and preclude economical and effective Customs control.

Superannuitants

Mr. Marples, in answer to Major Sir Frank Markham (Buckingham—C.), gave on February 7 the following details of the new scheme of supplemental superannuation of the British Transport Commission :

1. The scheme will apply to retirement annuities provided wholly or partly from Commission sources and payable to former employees of the British Transport Commission or its predecessors, other than those superannuitants who are at the date of retirement qualified as compulsory contributors for National Insurance benefit, i.e., pension, sickness, industrial injury, or disablement benefit.

2. The annuity eligible for supplement will be the basic retirement annuity and any supplementation under the Commission's existing schemes of supplementation dated April, 1955, and April, 1956.

3. Subject to paragraph 4, annuitants will receive supplements according to the following :—

Annuitants of L.M.S. Superannuation Fund

Year of Retirement	per cent	Minimum increase
		£
On or before June 30, 1946	12	40
July 1, 1946-December 31, 1946	8	30
1947	6	25
1948		
1949	4	15
1950		
1951	2	10
1952		
1953 and later	None	

Other Annuitants

Year of Retirement	per cent	Minimum increase
		£
On or before June 30, 1946	12	40
July 1, 1946-December 31, 1947	10	35
1948	8	30
1949		
1950	6	25
1951		
1952	4	15
1953		
1954	2	10
1955		
1956 and later	None	

4. There will be no limit to the amount of the annuity to be supplemented but the maximum amount of any supplement payable under this 1961 scheme will be £100 a year.

5. The Commission's existing schemes of supplementation dated April, 1955 and April, 1956, will continue in force and any supplements payable from this 1961 scheme will be additional thereto.

6. The scheme will come into effect on, and the supplements will be payable with effect from April 1, 1961.

CONTRACTS AND TENDERS

Earthworks for standard-gauge project in Victoria

The Victorian Government Railways has placed a contract valued at £257,000 for earthworks between Dynon and Jacana in connection with the standard-gauge project. Details of the standard-gauge route through the metropolitan area to Melbourne are given on page 156.

British Railways, North Eastern Region, has placed the following contracts:—

Talson Construction Co. Ltd.: renewal of the cattle dock sidings and the provision of a concrete deck and drainage at Hillhouse Goods Yard, Huddersfield

Wm. Wadsworth & Sons Ltd.: supply of two 30-cwt. goods lifts at Newcastle Central Station

Randle & Co. Ltd.: demolition of the existing signalbox and construction of a new box at Mainsforth Crossing, West Hartlepool

Quibell & Son Ltd.: provision of toilet facilities at Paragon Station, Hull

Vallance Electrical Engineers Limited: provision of electric lighting installation at Bradford Hammerton Street Diesel Depot

Mitchell Construction Co. Ltd.: construction of two bridges and a subway at Lamesley new marshalling yard

J. Hinchcliffe & Son Ltd.: re-surfacing of roadways and fixing of sleeper ends at Bradford Valley Goods Depot

Yorkshire Electricity Board: provision of a 1,500-kVA. electricity supply at Healey Mills new marshalling yard

Salisbury Precision Engineering Limited: supply of lifting tables for handling diesel engines for the Chief Mechanical & Electrical Engineer's Department

Pirelli General Cable Works Limited: provision of lighting towers at Bradford Valley Goods Depot

E. Kilburn & Son Ltd.: spreading and compacting of ash ballast at the new marshalling yard at Healey Mills

R. Costain Limited: provision of concrete ducts for telecommunication cables between the telephone exchange and offices at Newcastle Central Station.

BOARD OF TRADE

The Export Services Branch, Board of Trade, has received calls for tenders as follow:—

From Pakistan:

70 magneto type table telephones.

The issuing authority is the Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P3/HE/13/ACST/58 The closing date is February 27, 1961. The Board of Trade reference is ESB/3692/61.

34 overhead water tanks.

The issuing authority is the Chief Controller of Stores, North Western Railway, Empress Road, Lahore, to whom bids should be sent. The tender No. is S-640/PIC/3-60. The closing date is March 4, 1961. The Board of Trade reference is ESB/3709/61.

11 items including mild steel and spring steel flats, mild steel bearing plates, round spikes and dog spikes, and points and crossings.

The issuing authority is the Chief Controller of Stores, North Western Railway, Empress Road, Lahore, to whom bids should be sent. The tender No. is 211-S/291-TSO The closing date is March 7, 1961. The Board of Trade reference is ESB/3708/61.

108,500 rubber washers for 2-in. universal coupling.

The issuing authority is the Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P5/ACST/EVB/4/61. The closing date is February 27, 1961. The Board of Trade reference is ESB/3687/61.

From Ceylon:

Supply of centre and capstan lathes.

The issuing authority is the Crown Agents for Oversea Governments & Administrations, 4 Millbank, London, S.W.1, who are acting as purchasing agents. The tender No. is EM2/Ceylon Railway 3178. The closing date is March 15, 1961. The Board of Trade reference is ESB/3706/61.

From Australia:

Supply of wheels for "A" class diesel electric locomotives.

The issuing authority is the Secretary, Western Australian Government Tender Board, 74 Murray Street, Perth, to whom bids should be sent. The tender No. is 13A 1961. The closing date is March 2, 1961. The Board of Trade reference is ESB/3712/61.

645 mild steel keystone floor sheets for 120 suburban trailer carriages.

The issuing authority is the Victorian Government Railways, Spencer Street, Melbourne, C.1, to whom bids should be sent. The tender No. is 61,877. The closing date is February 22, 1961. The Board of Trade reference is ESB/3015/61.

From Sudan :

1 motor driven automatic tangential die head bolt screwing and nut tapping machine.

The issuing authority is the Stores Department, Sudan Railways, Atbara, to whom bids should be sent. The tender No. is 2313. The closing date is March 13, 1961. The Board of Trade reference is ESB/3040/61. No further information is available at the Board of Trade.

1 18-in. stroke shaping machine.

The issuing authority is the Controller of Stores, Sudan Railways, Atbara. Tenders must be accompanied by a 2 per cent deposit. The tender No. is 2320. The closing date is March 22, 1961. The Board of Trade reference is ESB/3701/61. No further information about this call for tenders is available at the Board of Trade.

1 radial drilling machine.

The issuing authority is the Controller of Stores, Sudan Railways, Atbara. Tenders must be accompanied by a 2 per cent deposit. The closing date is March 15, 1961. The tender No. is 2315. The Board of Trade reference is ESB/3699/61. No further information on this call for tenders is available at the Board of Trade.

1 motor-driven locomotive tubes descaling machine to deal with smoke and flue tubes from 1¾ in. to 5½ in. dia. and capable of removing hard scale from inside of tubes. The tubes are to be fed through the machine automatically. The machine shall be provided with 15 h.p. motor.

The issuing authority is the Stores Department, Sudan Railways. Tenders should be addressed to the Office of Controller of Stores, Atbara, and accompanied by a 2 per cent deposit. The tender No. is 2314. The closing date is March 14, 1961. The Board of Trade reference is ESB/3704/61. No further information on this call for tenders is available at the Board of Trade.

2 drilling machines.

The issuing authority is the Controller of Stores, Sudan Railways, Atbara. Tenders must be accompanied by a 2 per cent deposit. The tender No. is 2316. The closing date is March 16, 1961. The Board of Trade reference is ESB/3700/61. No further information is available at the Board of Trade.

From Egypt:

2,550m. copper cables.

The issuing authority is the Purchases & Stores Department, Railways Building, Shoubra Subway, Cairo, to whom bids should be sent. The tender No. is E.R.330.G8/464. The closing date is March 13, 1961. The Board of Trade reference is ESB/2733/61. No further information is available at the Board of Trade.

From Greece:

50 tons of special product for the treatment of water fed to locomotive boilers.

The issuing authority is the Purchasing & Stores Department, Hellenic State Railways, 34 Thermistocleous Street, Athens, to whom bids should be sent. Local representation is essential. The tender No. is 4943. The closing date is February 15, 1961. The Board of Trade reference is ESB/3017/61.

From Portuguese East Africa :

77 items of iron and steel products (over 400 tons): angles, plates, channels and rivets.

The issuing authority is the Ports, Railways & Transport Department, Lourenco Marques, to whom bids should be sent. The tender No. is A/CFB/1/1-52/1961. The closing date is March 3, 1961. The Board of Trade reference is ESB/3022/61.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road W.C.1).

NOTES AND NEWS

North Eastern Region train service alteration. British Railways, North Eastern Region, has announced that an additional diesel multiple-unit train is now being provided, leaving Newcastle each weekday (Saturdays excepted) at 1.50 p.m., calling at Gateshead West at 1.53 p.m., Chester-le-Street at 2.03 p.m., and arriving Durham at 2.13 p.m.

B.I.C.C. Eastern Region Office. British Insulated Callender's Cables Limited has announced that from February 1, 1961, the Eastern regional staff will be operating from premises in Chelmsford. The address is Friars Walk, Friars Place, Chelmsford, Essex, tel. Chelmsford 58171-2. Stores will be established in the near future.

Massey-Ferguson record sales. World sales of Massey-Ferguson Group products increased 3 per cent in 1960. Total domestic and export sales of diesel engines, tractors and other products from operations in the U.K. rose by nearly 15 per cent over last year, with export sales a record at £45 million.

Trade mission to Iraq. A small party of British businessmen and industrialists, which has been organised jointly by the Advisory Council on Middle East Trade (A.C.M.E.T.) and the Federation of British Industries, left London last Wednesday week for Iraq. The purpose of the mission is to renew and strengthen trading contacts in Iraq; and to examine the prospects of increasing trade between the United Kingdom and Iraq, and of assisting in the development of the Iraqi economy. The leader of the party is Mr. H. G. Nelson, Managing Director, English Electric Co. Ltd., and Industrial Leader and Vice-Chairman of A.C.M.E.T.

Dorman Long capital increased. At an extraordinary general meeting of Dorman Long & Co. Ltd., in London on February 1, it was resolved to increase the authorised share capital from £30,000,000 to £50,000,000 by creation of 20,000,000 unclassified shares of £1 each. Although the company is not in any immediate need for capital it was felt to be advisable to increase the authorised capital in proportion to the company's organisation, undertaking, and activities.

Exide Battery factory in Australia. Associated Battery Makers of Australia (Pty) Limited, a subsidiary of the Chloride Electrical Storage Co. Ltd., has recently opened the first section of a new industrial battery production plant at Padstow, New South Wales. When the plant is completed towards the end of 1962, it will occupy an area of 19 acres and will become the company's administrative and production centre.

G.E.C. interim dividend. The Board of the General Electric Co. Ltd. has declared an interim dividend of 3 per cent for the year ending March 31, 1961. This interim is the same as last year and will be paid to the ordinary stockholders on the register on February 28, 1961. The board states that the provisional results for the first eight months' trading and the estimated figures for the remainder of the current financial year indicate that the profit for the year will be somewhat lower than last year, mainly because of reduced trading in the radio and domestic equipment groups. Trading in other groups has been maintained.

Diesel train derailment. The line between Manchester and Bolton, British Railways, London Midland Region, was blocked for more than 6 hr. on February 2, after a diesel train had run into two goods wagons which overturned while being shunted near Moses Gate Station. One of the two diesel coaches was derailed and a passenger received slight injuries.

W. H. Dorman link with U.S. group. A contract to sell British diesel engines throughout the United States has been announced by W. H. Dorman & Co. Ltd., the Stafford engine manufacturer. W. H. Dorman has agreed to supply Fairbanks-Morse & Company of Chicago with basic diesel engines in the 40-h.p. to 700-h.p. range. These basic engines will be shipped to the United States after testing and will then be fitted out with American-made filters, dynamos, self-starters, piping, and so on, at the Fairbanks-Morse diesel engine works at Beloit, Wisconsin. They will then be marketed throughout America by the widespread sales organisation of Fairbanks-Morse. The 20-year agreement is expected to be worth $5 million a year to W. H. Dorman within the next three years. The total for 1961 will exceed $1 million.

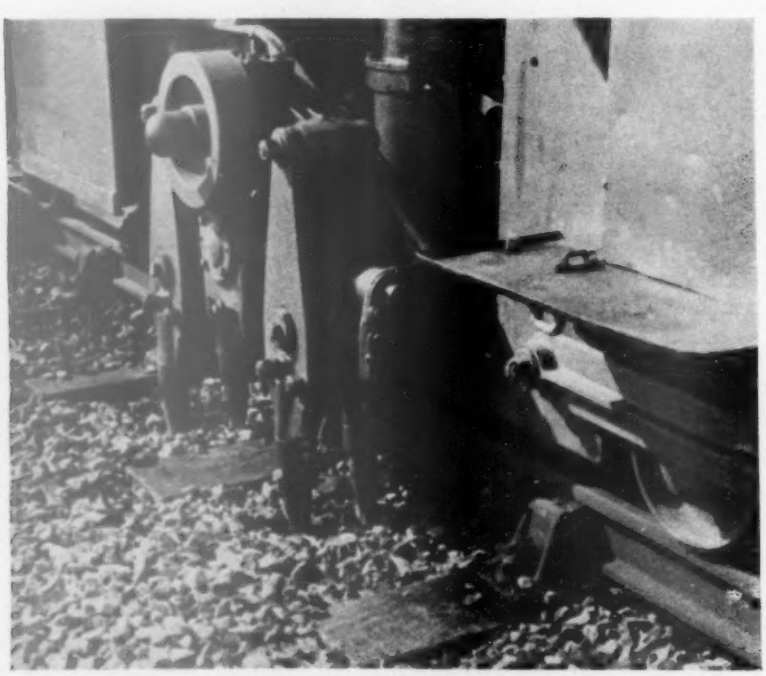
Railway Benevolent Institution. At its January meeting, the Board of the Railway Benevolent Institution granted annuities to 16 widows and six members involving an additional liability of £527 15s. a year. To meet cases of immediate necessity, 174 gratuities were also granted amounting to £1,677 10s. Grants made from the casualty fund during December, 1960, amounted to £1,580 12s.

Kenilworth price reductions. Price reductions ranging from 10 to 20 per cent, affecting a number of products, are announced by the Kenilworth Manufacturing Co. Ltd. The reductions apply to the Hermetal Double Bond range of epoxy formulations used as structural adhesives and to the D.B. Toolform range of tooling compounds.

Central Wagon results. Although net profit of the Central Wagon Co. Ltd. for the year ended September 30, 1960, fell by 9 per cent compared with the preceding 12 months, the dividend is increased by one-third, to 20 per cent. One reason for the smaller profit is understood to be a reduction in wagon repairs for British Railways. The company has received substantive orders for new wagons, and conversion of old rolling stock and machining into scrap for sale has been profitable.

New rail halt at Banchory. A new halt has been opened half a mile west of Banchory Station on the Deeside line from Aberdeen to Ballater. It is named Dee Street, and is close to the shopping centre of Banchory and the recreation grounds. Calls are made at the halt by six diesel trains in each direction between Aberdeen and Ballater.

SHELL-MEX FILM



Still from new Shell-Mex film "An Industrial Notebook on Iron and Steel" (editorial this week refers)

The guard on the train will issue tickets to passengers travelling from Dee Street. There are cheap day return fares to Aberdeen and Ballater.

Cimex exhibition. Last week, Cimex Limited staged its eighth annual exhibition of floor maintenance machines and methods at the Seymour Hall, London. During the exhibition, lectures were given by a leading architect and a scientist. A panel of experts assisted in the discussion. Exhibits included two new machines—a completely redesigned version of the Eagle scrubbing and drying machine and a high-speed version of the Mallard scrubbing and polishing unit. Shown on this page are two examples of other items in the Cimex range.

New engineering company. Mr. Alex Sykes, M.I.Mech.E., M.I.Prod.E., M.I.Loco.E., has relinquished his position as Senior Engineer & Chief Inspecting Engineer with Messrs. Rendel, Palmer & Tritton as from December 31 last, and has taken up an appointment as Managing Director of Morris & Butters Limited, a new company with registered office at Motherwell, Scotland. Morris & Butters Limited is a joint venture by Herbert Morris Limited, Loughborough, and Butters Bros. & Co. Ltd., Glasgow, which has been formed to foster the development, design, and marketing of engineering equipment of interest to both concerns.

Change of telephone number. High Duty Alloys Limited has announced that the telephone number for its Extrusion Division has been changed to Workington 2581-6.

Railway Enthusiasts' Club tour. The Railway Enthusiasts' Club has arranged an L.&S.W.R. Suburban Rail Tour on March 19, behind one of the remaining Adams's 4-4-2 radial tank engines, now being displaced from the Lyme Regis branch by more modern motive power. The special train will start from Waterloo at about 1.45 p.m. It will then travel *via* Twickenham, Windsor Riverside, Staines West Curve, Addlestone, Guildford, Leatherhead old station and Wimbledon, returning to one of Waterloo's local platforms (1/2/3). The return fare will be 25s. and application for tickets should be made to A. P. Miall, "Hurstbourne," Wainsford Road, Everton, Lymington, Hants.

Two examples from the Cimex Exhibition—paragraph on this page refers. (Left): "Aquedust" wet and dry cleaner; (right): "Solo" low-price scrubber and polisher

North Eastern Region train service alterations. British Railways, North Eastern Region, has announced that the 10.25 p.m. train from Darlington to York, second class only, has been replaced by a diesel multiple-unit train, with both first and second class accommodation. The train leaves Darlington at 10.25 p.m., as previously, but has been retimed to call at Northallerton at 10.46 p.m. (six min. earlier than before) and arrives at York at 11.17 p.m. (11 min. earlier than before).

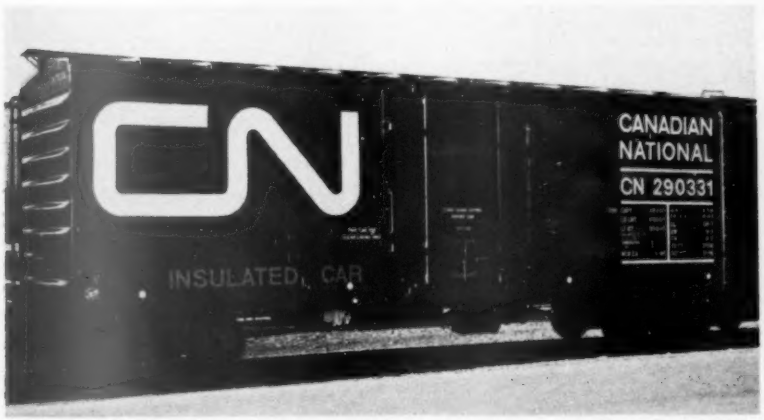
Dorman Long products in demand. Since the end of the 12 months ended September 30, 1960, demand for the rolled steel products of Dorman, Long & Co. Ltd. has been maintained at a high level. Outputs of ingots and of rolled steel for the three months to December 31, 1960, exceeded those for the same period of 1959, but there is a lower tonnage of some products in the forward order book now than in September, 1960. The Chairman, Sir Ellis Hunter, states that production costs were increased toward the end of the financial year by the advances in coal and coke prices and again in November by the rise in wages. These and other increases in costs have not yet been reflected in the prices for rolled steel.

D.P. Battery Co. Ltd. at the Electrical Engineers Exhibition. Samples of the range of Tudor stationary batteries and D.P. Kathanode traction batteries will be featured on the D.P. Battery Co. Ltd. stand at the Electrical Engineers Exhibition at Earls Court on March 21-25. Prominently displayed will be the latest design of Tudor high-performance stationary cells in sealed glass boxes. These cells give a saving of up to 50 per cent in space or an increase of up to 100 per cent in capacity when compared with conventional B.S. sealed cells.

World Bank loan to Burma. The World Bank has made a loan equivalent to $14 million to the Burma Railway Board for a rehabilitation and modernisation programme. The proceeds of the loan will be used to purchase diesel locomotives, railcars and rolling stock, together with spare parts and workshop equipment. The new equipment is an essential part of the Railway's programme to increase operating efficiency, reduce costs and provide additional carrying capacity for Burma's growing freight and passenger traffic. Seven private banks are participating in the loan, without the World Bank's guarantee, for a total of $1,450,000, representing the first three maturities and part of the fourth maturity, which fall due in the period between March 1, 1964, and September 1, 1965.

A.C.V. acquisition. The Boards of Associated Commercial Vehicles Limited, and John I. Thornycroft Limited, have announced that agreement, in principle, has been reached whereby A.C.V. will purchase the whole of the share capital (i.e. 750,000 ordinary shares of £1 each) of Transport Equipment (Thornycroft) Limited. Transport Equipment (Thornycroft) Limited, a wholly owned

NEW C.N.R. TRADEMARK



Canadian National Railway insulated wagon bearing the new trademark *(see editorial reference on page 150)*

subsidiary of John I. Thornycroft Limited, comprises all the road transport and automotive diesel engine manufacturing and selling interests of John I. Thornycroft. The purchase consideration will be 150,000 fully paid £1 ordinary shares in A.C.V. ranking *pari passu* with the present A.C.V. ordinary share capital, and £1,000,000 in cash, to be paid over two years and subject to adjustments on account of trading prior to acquisition.

Sharp Control Gear and Electran Coil combine. A new company, Expert Industrial Controls Limited, has been formed to bring together under one name two members of the Expert Tool Group—Sharp Control Gear Limited, and Electran Coil Co. Ltd. The new company will reinforce and expand the development, production, and the home and export marketing operations of Sharp and Electran in the fields of traction and industrial control gear, industrial solenoids, and other forms of automation equipment.

Railway Stock Market

There has been a larger volume of business in stock markets, which again reflected reinvestment of Ford Motor pay-out money, while speculative activity in industrial shares was stimulated by more take-over developments. Sentiment was less affected by the official warnings about export trade or by the hints that if the rise in costs persists, there is a possibility of higher steel prices later in the year.

Foreign rails attracted little attention. Costa Rica ordinary stock was 42½ with the first and second debentures 96 and 113 respectively. Chilean Northern 5 per cent first debentures were 52½ and Guayaquil & Quito assented bonds 50½.

Paraguay Central prior debentures were quoted at 17½, Salvador Railway consolidated stock at 4½, and Brazil Railway bonds at 5, while in other directions, International Railways of Central America were $18½ with the preferred stock $99½.

Antofagasta ordinary stock remained at 16½, but the preference stock attracted some attention and strengthened from 35½ a week ago to 36; the 4 per cent perpetual debentures were 46½.

Canadian Pacifics reflected the better trend of Wall Street markets, which were helped by hopes that President Kennedy will succeed in stimulating the U.S. economy. At $42⅛ Canadian Pacifics compared with $40½ a week ago, but the company's sterling stocks were again affected by the easier trend in British Funds, the preference having come back further from 57 to 55⅞ and the 4 per cent debentures eased from 58½ to 58¼. White Pass shares eased from $10⅜ to $10⅜.

Nyasaland Railways shares remained at 9s. with the 3½ per cent debentures 35½. Barsi Light Railway ordinary stock has changed hands at 14. West of India Portuguese capital stock was quoted at 115½ and the 5 per cent debentures at 96.

Elsewhere, Sao Paulo Railway 3s. units were 10½d. Mexican Central "A" bearer debentures moved up from 59½ to 60½.

Featured among shares of locomotive builders and engineers was a rise from 27s. a week ago to 32s. 6d. in Birmingham Wagon. North British Loco shares eased from 6s. 9d. to 6s. 6d. Wagon Repairs 5s. shares were firm at 19s. 6d. and Gloucester Wagon 10s. shares steady at 11s. 3d. while G. D. Peters, which remained as firmly held as ever, were again quoted at 17s. 6d.

Beyer Peacock 5s. shares at 7s. 3d. eased a little after their recent rally, but Charles Roberts 5s. shares at 7s. 6d. compared with 7s. 9d. a week ago.

Pressed Steel 5s. shares attracted buyers and improved from 26s. 9d. to 27s. 6d. while Dowty Group 10s. shares put on 6d., at 34s. 9d., but Leyland Motors came back from 82s. 6d. to 79s. Stone-Platt were a good feature, having risen on balance from 56s. to 61s. Vickers strengthened to 29s. and Ruston & Hornsby from 26s. 3d. to 26s. 9d. Tube Investments were 75s. 6d., Mather & Platt firmed up to 46s. 9d., and Metal Industries to 59s. 9d.

In electricals A.E.I. at 41s. compared with 41s. 3d. a week ago, G.E.C. were 31s. 6d. compared with 31s. 9d. and English Electric rose from 32s. 6d. to 33s. 6d. B.I. Cables rallied to 56s. 6d. Among other shares, Ransome & Marles 5s. shares were 17s. 7½d. and Pollards Bearing 4s. shares 33s. 6d. T. W. Ward moved up to 65s. G. & J. Weir 5s. shares to 16s., and Renold Chain held steady at 34s. 6d. Steel shares were inclined to rally after the reaction which followed the warnings about falling off in demand for steel and rising costs, the City view being that dividends should remain at last year's levels, which were conservative payments.

Forthcoming Meetings

February 10 (*Fri.*). The Institution of Traffic Administration, Portsmouth Group, at the Solent Hotel, Southsea, at 7 p.m. Address by Chairman of National Council.

February 10 (*Fri.*). The Institute of Transport, Northern Section, at the Royal Station Hotel, Newcastle, at 7 p.m. "Rural bus services," Mr. D. S. Deacon.

February 10 (*Fri.*). The Institute of Transport, Swindon Group, at the Engineering Society's Rooms, Emlyn Square, at 7.15 p.m. "Work study in transport," Mr. J. E. P. Dobson.

February 13 (*Mon.*). The Historical Model Railway Society, London Group, at Keen House, Calshot Street, London, N.1, at 7 p.m. "The development of the 4-4-0 Type," Mr. R. J. Woodfin.

February 14 (*Tue.*). The Institute of Transport, Edinburgh Discussion Group, at 23 Waterloo Place, Edinburgh, at 5.30 p.m. "The Glasgow suburban electrification scheme," Mr. J. C. H. Brash.

February 14 (*Tue.*). The Institute of Transport, Yorkshire Section, at the Griffin Hotel, Leeds, at 6.30 p.m. "The application and potentialities of work study to rail transport," Mr. A. Dean.

February 14 (*Tue.*). The Institution of Electrical Engineers, Education Discussion Circle, at Savoy Place, London, W.C.2., at 6 p.m. "Technical teacher training," Discussion.

February 14 (*Tue.*). The South Wales & Monmouthshire Railways & Docks Lecture & Debating Society, and the British Railways Bristol Lecture & Debating Society, at Bristol. Debate: "That the country cannot afford to be without a fully integrated transport system."

February 14 (*Tue.*). The Permanent Way Institution, Sheffield Section, at the Royal Victoria Hotel, Sheffield, at 6.45 p.m. "Unknown Railways," Mr. R. Shephard.

February 14 (*Tue.*). The Institution of Civil Engineers, at Great George Street, Westminster, S.W.1, at 5.30 p.m. Informal Discussion: "Safety precautions on civil engineering works, with particular reference to recent accidents on bridge construction," Mr. H. Shirley Smith.

February 15 (Wed.). The Institution of Railway Signal Engineers, York Section, at the Signalling School, Toft Green, York, at 5.30 p.m. "The duties of a railway medical officer," Dr. R. Fraser Mackenzie.

February 15 (*Wed.*). The Peterborough Railway Discussion Group, at Peterborough Technical College, Eastfield Road, at 6.45 p.m. "Italian State Railways," Mr. Kemeny.

February 15 (*Wed.*). The Institute of Transport, Humberside Section, at the Chamber of Commerce & Shipping, Hull, at 6 p.m. "Regulations and conditions applicable to the transport of dangerous goods," Mr. S. Tuckwood.

February 15 (*Wed.*). The Institution of Electrical Engineers, at Savoy Place, London, W.C.2, at 5.30 p.m. "A general theory of depreciation of engineering plant," Mr. D. Rudd.

February 15 (*Wed.*). The Electric Railway Society, Birmingham Group, at the Engineering Centre, Stephenson Place, Birmingham 2, at 7.15 p.m. "Simplon—St. Gotthard, etc," Mr. W. H. Bett.

February 16 (*Thu.*). The Institute of Transport, Bournemouth-Poole Group, at the Town Hall, Bournemouth, at 5.30 p.m. "Staff relations in road haulage," Mr. W. C. Webster.

February 16 (*Thu.*). The Institution of Electrical Engineers, at the Central Hall, Westminster, S.W.1, at 6 p.m. Faraday Lecture: "Transistors and all that," Mr. L. J. Davies.

February 17 (*Fri.*). The Railway & Canal Historical Society, West Midlands Group, at the Engineering Centre, Stephenson Place, Birmingham 2, at 7.15 p.m. "Early western railroads," Mr. G. Kendall.

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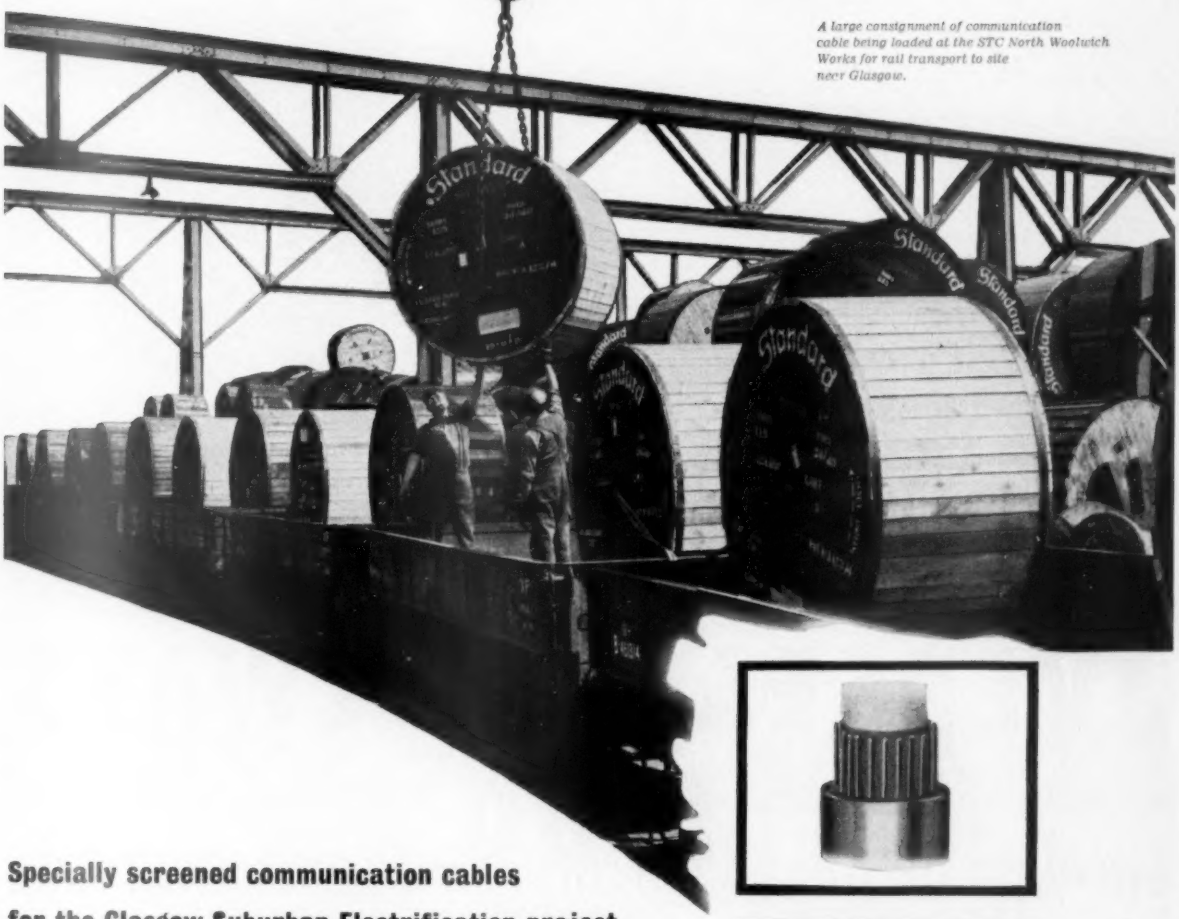
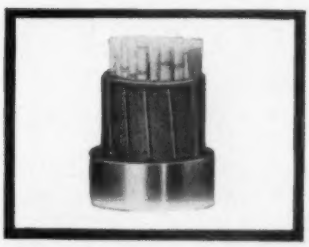
STC and Railway Modernisation



A large consignment of communication cable being loaded at the STC North Woolwich Works for rail transport to site near Glasgow.



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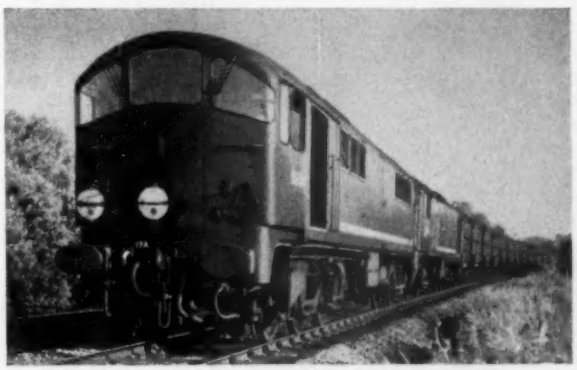

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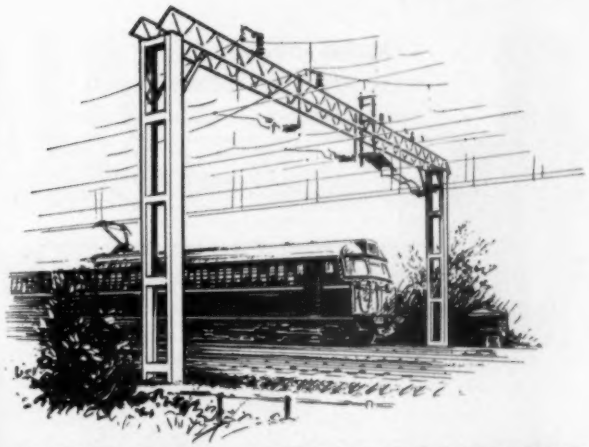

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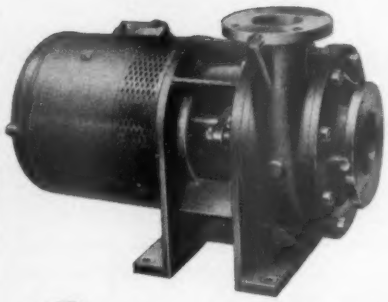

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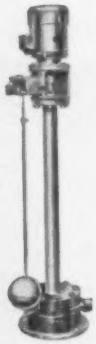

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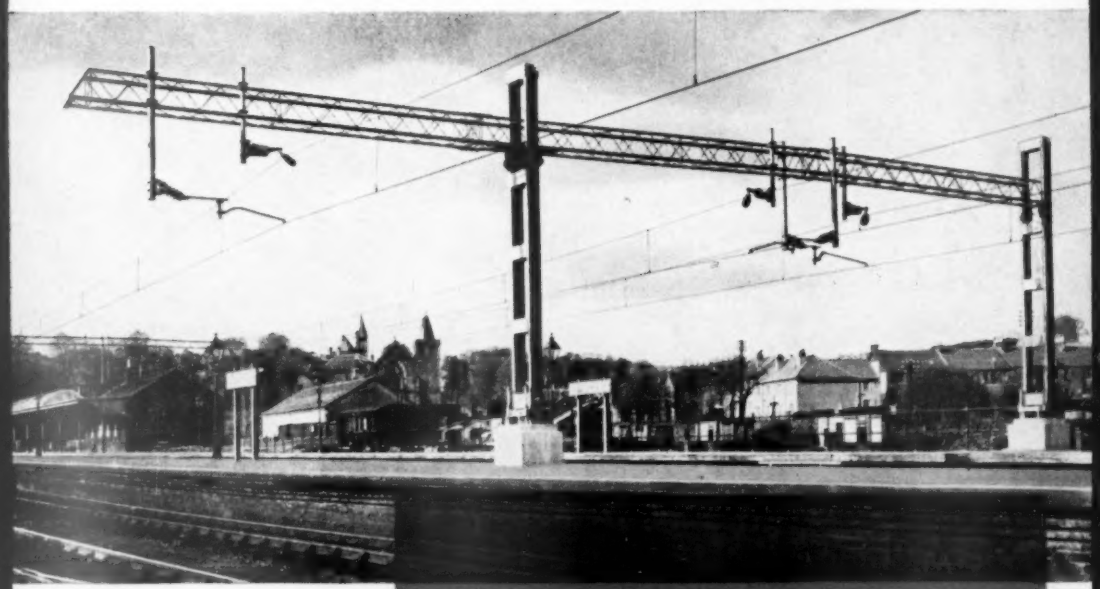

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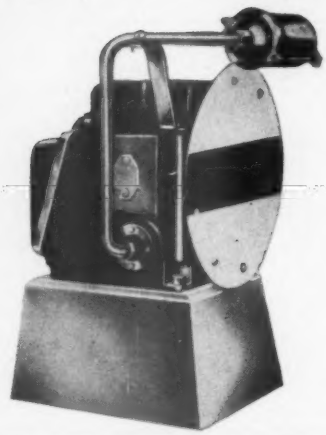
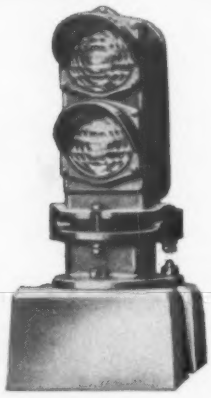


1

1 Solenoid-operated shunt signal

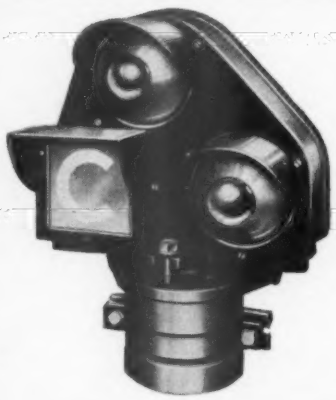
Intended primarily for use as a ground-signal, the solenoid-operated disc type is provided with an individual flood light for illumination at night.



2

2 Type ME colour-light shunt signal

This type is available as a single-aspect, two-aspect or three-aspect signal with doublet lenses for use as a shunt signal, or with an illuminated letter for call-on purposes.



3

3 Type PA position-light shunt signal

Designed for shunt or call-on moves, the P.A. type has two lunar white lights in the horizontal position for STOP and two similar lights at 45 degrees for PROCEED. Since no red aspect is employed, it eliminates the need for clearing these signals for a running move. The signal can also be supplied with a small illuminated letter, as illustrated, when used as a single aspect signal for call-on or similar moves.

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